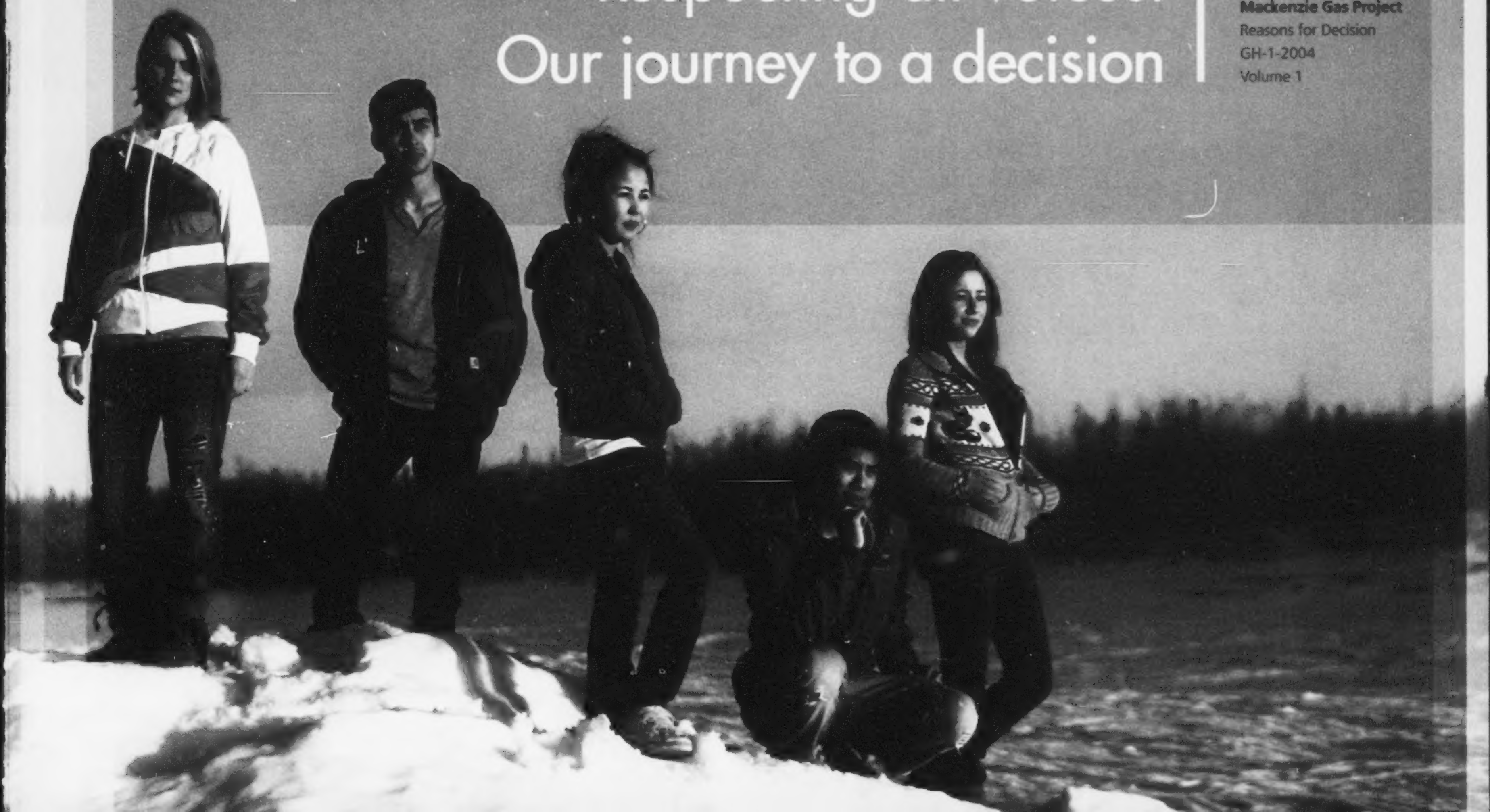
National Energy Board
Office national de l'énergie
Canada

Respecting all voices: Our journey to a decision

Mackenzie Gas Project
Reasons for Decision
GH-1-2004
Volume 1



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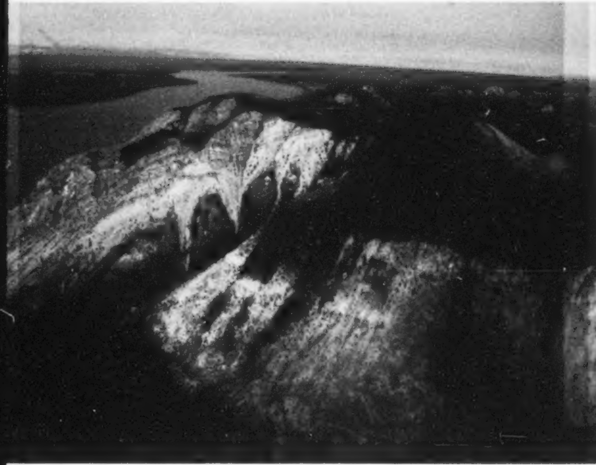
Our journey

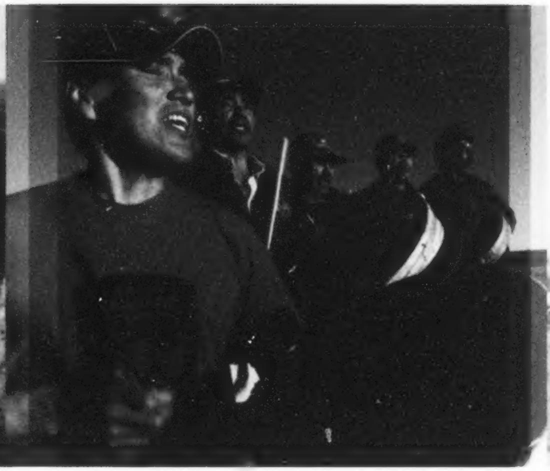
Parsons Lake
North Pad

The Mackenzie Gas Project proposal launched us on a journey. Like many travellers on the Dehcho—the Mackenzie River—we began this journey with open minds about where it would take us.

Our goal was to encourage public participation and listen to the people so they could help us determine the public interest of the project. We heard from many Northerners and other Canadians.

Our shared body of knowledge grew in much the same way that the Dehcho gains strength and volume as it flows north to the Beaufort Sea. We heard, again and again, that the Mackenzie Gas Project would have deep and lasting effects on the lives and environment of northern people. The project would bring new economic development to a largely untouched land and its people. We recognized the importance of this unique environment and its role in the well-being of individuals and communities. The environment and culture of the North helped determine our course as we moved towards our decision.





Respecting all voices: Our journey to a decision describes what we learned on our journey. This volume includes examples of the many voices we heard. By responding to the important questions asked during our hearing, we hope to show the reasoning that led to our decision. The other volume of our report, *Technical Considerations: Implementing the Decision*, describes how the project would be built, operated and regulated.

In Part 1 of *Our journey*, we discuss the project as a whole and some of the factors we assessed in determining whether it would be in the public interest. Part 2 looks more closely at the natural gas fields, gathering pipelines and processing facilities in the Mackenzie Delta region. Part 3 addresses the 1196 kilometre long natural gas pipeline that would run along the Mackenzie Valley to Alberta and the 457 kilometre pipeline that would carry natural gas liquids to Norman Wells. Part 4 outlines the decision that we reached at the end of our journey. We believe that this decision respects the many voices we heard along the way.

National Energy Board

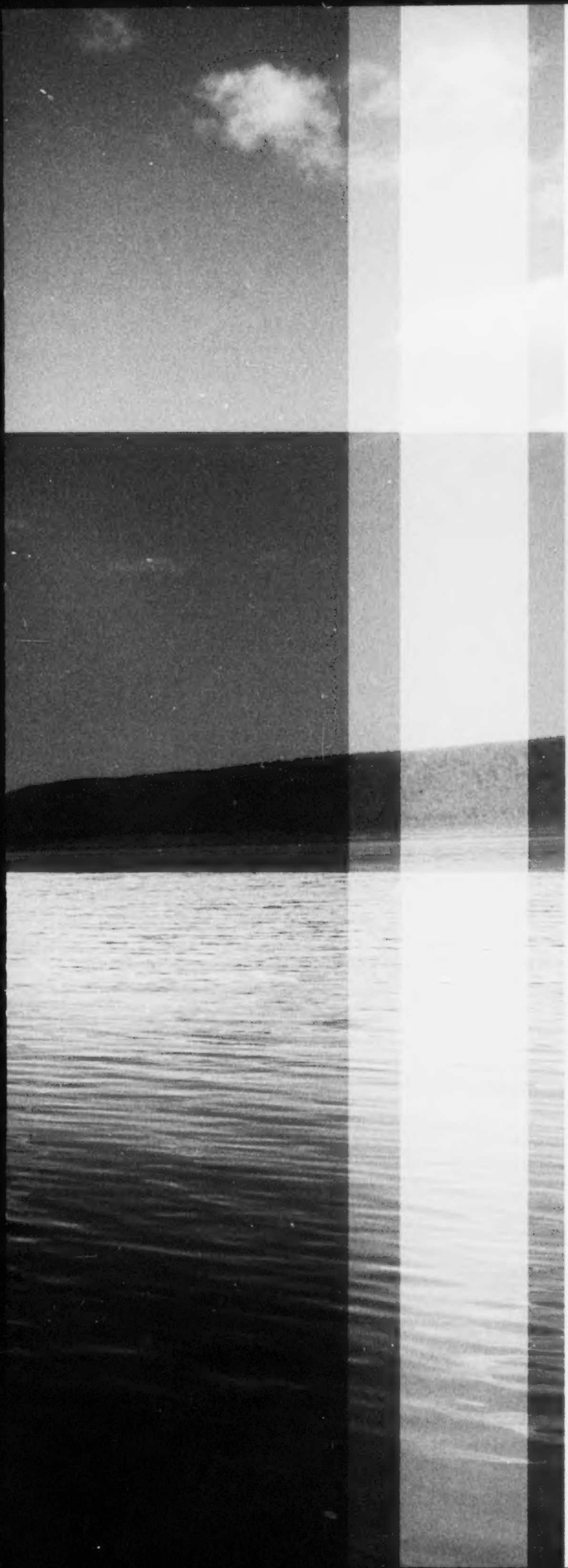
K.W. Vollman
Presiding Member

G. Caron
Member

D. Hamilton
Member

Part 1

The project as a whole



1.1

What is the Mackenzie Gas Project?

A group of companies has asked us to approve their proposal to develop three natural gas fields in and near the Mackenzie Delta. They would also build pipelines to ship the natural gas and natural gas liquids south to markets. Together these proposals are called the Mackenzie Gas Project. The project would be built over four years and cost about $16 billion. An average of 5,700 people would work on it during the construction period.

The Mackenzie Gas Project is a proposal to develop three natural gas fields and to transport the natural gas and natural gas liquids to southern markets in pipelines buried 60 to 90 centimetres below the surface. The gas fields—Niglintgak, Taglu, and Parsons Lake—are in or near the Mackenzie Delta. The key parts of the project are:

- at least 28 natural gas wells, drilled from six well pads, and other production facilities in the three fields;
- the Mackenzie Gathering System consisting of 190 kilometres of pipelines that take the natural gas from the fields to the Inuvik Area Facility for processing;
- a 457 kilometre long, 250 millimetre (10 inch) diameter pipeline to carry natural gas liquids from the Inuvik Area Facility to the existing crude oil pipeline at Norman Wells; and
- the 1196 kilometre long, 750 millimetre (30 inch) diameter Mackenzie Valley Pipeline carrying natural gas from the Inuvik Area Facility to northwestern Alberta.

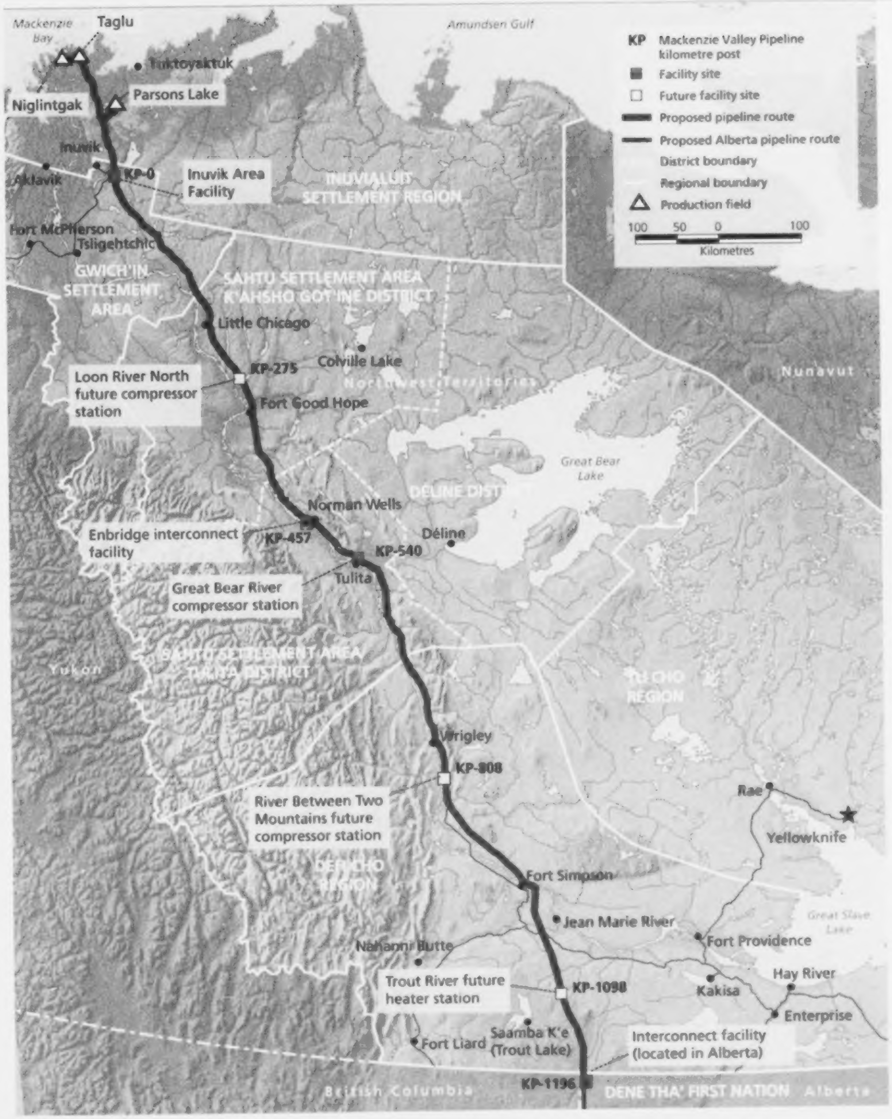

Mackenzie Bay
Taglu
Tuktoyaktuk
Amundsen Gulf
Niglintgak
Parsons Lake
Inuvik
Aklavik
KP-0
Inuvik Area Facility
INUVIALUIT SETTLEMENT REGION
Fort McPherson
Tsiigehtchic
GWICH'IN SETTLEMENT AREA
SAHTU SETTLEMENT AREA K'AHSHO GOT'INE DISTRICT
Little Chicago
Colville Lake
Loon River North future compressor station
KP-275
Fort Good Hope
Northwest Territories
Nunavut
Great Bear Lake
Norman Wells
DELINE DISTRICT
Enbridge interconnect facility
KP-457
Déline
KP-540
Great Bear River compressor station
Tulita
Yukon
SAHTU SETTLEMENT AREA TULITA DISTRICT
TLI CHO REGION
Wrigley
KP-808
River Between Two Mountains future compressor station
DEHCHO REGION
Rae
Yellowknife
Fort Simpson
Jean Marie River
Great Slave Lake
Nahanni Butte
Fort Providence
Trout River future heater station
KP-1098
Kakisa
Hay River
Enterprise
Fort Liard
Sambaa K'e (Trout Lake)
Interconnect facility (located in Alberta)
KP-1196
British Columbia
DENE THA' FIRST NATION
Alberta
KP Mackenzie Valley Pipeline kilometre post
Facility site
Future facility site
Proposed pipeline route
Proposed Alberta pipeline route
District boundary
Regional boundary
Production field
100
50
0
100
Kilometres

Figure 1-1

Project overview

The Mackenzie Valley Pipeline would transport natural gas 1196 kilometres from Inuvik to northern Alberta. The natural gas in the pipeline would be 93 percent methane, mixed with small amounts of carbon dioxide, nitrogen, and hydrocarbons such as ethane and propane. The natural gas liquids pipeline from Inuvik to Norman Wells, operated as part of the Mackenzie Gathering System, would carry a mixture of hydrocarbons similar to gasoline.

Mackenzie Valley Pipeline natural gas volumes

	Millions of cubic metres per day	Millions of cubic feet per day
One compressor station near Tulita	27.3	964
Three compressor stations	34.3	1210
Maximum capacity with 14 compressor stations (including 11 that have not been applied for)	49.8	1760

The Mackenzie Valley Pipeline would be designed so that with one compressor station near Tulita it could transport 27.3 million cubic metres (just under 1 billion cubic feet) of natural gas per day. If the companies build a total of three compressor stations, the pipeline could transport 34.3 million cubic metres (1.2 billion cubic feet) per day. For comparison, this would be enough to supply about two-thirds of the six million Canadian households that used natural gas to heat their homes in 2009.

The companies would have to apply to the National Energy Board to build more compressor stations than the three contained in the current application. The pipeline engineering design allows for up to 14 compressor stations in total. If these were built, the pipeline could carry 49.8 million cubic metres (1.8 billion cubic feet) of natural gas per day.

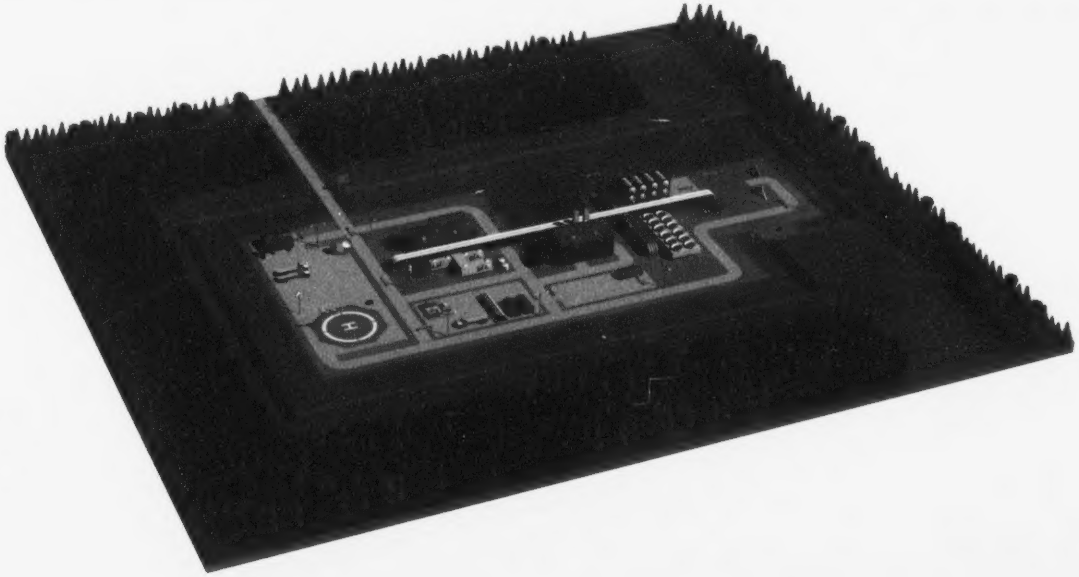
Affiliates of Imperial Oil, Shell, ConocoPhillips, and ExxonMobil would develop the three natural gas fields. They would also jointly own the Mackenzie Gathering System, consisting of the upstream gathering pipeline, the Inuvik Area Facility, and the natural gas liquids pipeline. Along with the Mackenzie Valley Aboriginal Pipeline Partnership Limited (Aboriginal Pipeline Group) they would own the Mackenzie Valley Pipeline.

The entire Mackenzie Gas Project would cost an estimated $16.2 billion and take four years to build. Construction of the project would create an average of 5,700 direct jobs annually.

Figure 1-2

Typical compressor station

The compressors increase the pressure of the gas and push it down the pipeline. Compressors on a natural gas pipeline are typically powered by gas turbine engines similar to those used on jet airplanes.



Twenty percent of these jobs, or more than 1,100 per year, would be created in the Northwest Territories. After construction an average of 312 direct jobs per year would be created over the first 20 years of operation, including drilling and operations personnel for the three producing fields and operations personnel for the pipelines. Sixty-six percent or 205 of the 312 direct jobs created annually during operation would be filled by Northwest Territory residents.

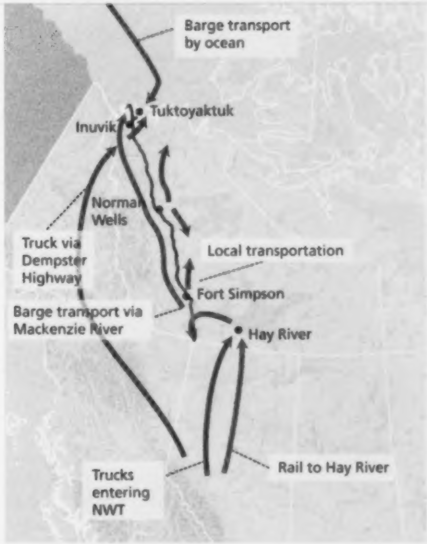
About 19,000 people—12,000 in the Northwest Territories and 7,000 in Alberta—live in the vast areas touched by the proposed development. Most of the people in the project areas are Aboriginal. Most of the areas are subject to Aboriginal land claims, agreements or treaties. From north to south, the Aboriginal regions are the Inuvialuit Settlement Region, the Gwich'in Settlement Area, the Sahtu Settlement Area, the Dehcho Region, and the Dene Tha' First Nation.

In October 2004 the National Energy Board received applications for:

- a Certificate of Public Convenience and Necessity authorizing the construction and operation of the Mackenzie Valley Pipeline under Section 52 of the *National Energy Board Act*;
- approval of toll and tariff principles for the Mackenzie Valley Pipeline under Part IV of the *National Energy Board Act*;

Figure 1-3

Transportation logistics map



The project would use about 442 000 tonnes of steel pipe. Other major components include camp and facility modules, construction and drilling equipment, borrow material and fuel.

- **The plan is to move pipe and fuel to Hay River by rail, then by barge to locations north of Fort Simpson, and by truck to locations south of Fort Simpson.**
- **Project personnel would be moved primarily by aircraft and then by bus.**
- **Borrow material (soil and gravel used for construction) would be moved by truck, mostly on project roads.**
- **Peak activities would occur:**
  - **in summer, with barges on the Mackenzie River from Hay River and Liard Ferry;**
  - **in winter, with trucks transporting material to project facility and infrastructure sites; and**
  - **at the start and end of the winter construction seasons, with aircraft transporting project personnel.**

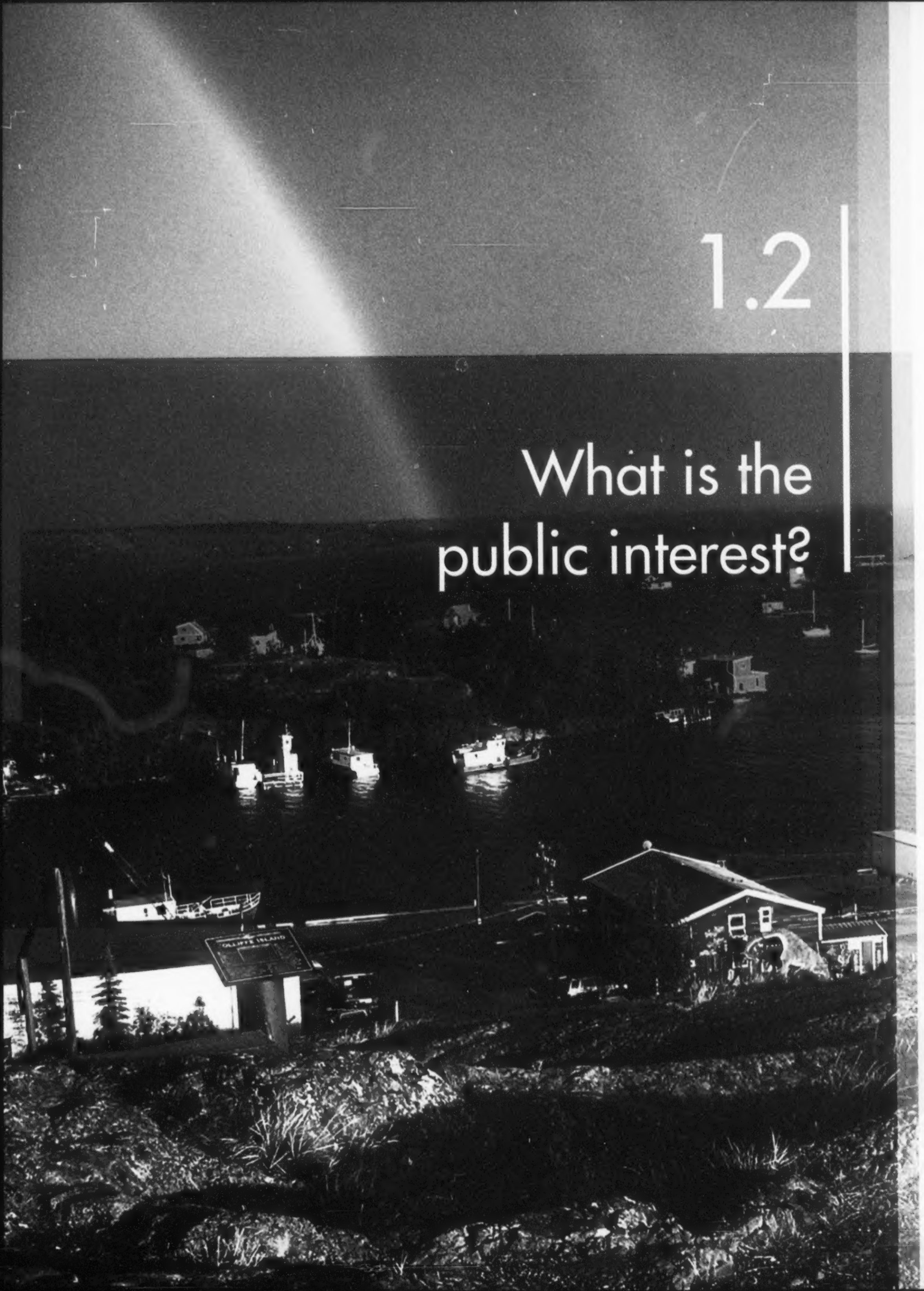
- authorization to carry on work and activity in respect of the Mackenzie Gathering System under paragraph 5(1)(b) of the *Canada Oil and Gas Operations Act*; and
- approval of development plans for the Niglintgak, Taglu and Parsons Lake fields under section 5.1 of the *Canada Oil and Gas Operations Act*.

These applications were all considered during our hearing and in this decision. We also heard that further natural gas development could occur in the Northwest Territories and Yukon if this project goes ahead. For example, if companies find natural gas in new areas, more gathering pipelines might be built. Additional compressor stations might be added to the Mackenzie Valley Pipeline at some point. Future development is not part of the applications before us. Companies would have to submit separate applications to do these things.

Richard Nerysoo
President
Gwich'in Tribal Council
Inuvik

April 20, 2010

These transportation infrastructure projects will help establish a strong, ongoing base for a sustainable economy in the North, one that could see more people living here, more wealth generated, and a greater and fulfilling role for the Aboriginal peoples of the region and in their homeland; certainly, an opportunity for the Gwich'in to participate in a northern economy, which is an objective set out in the Gwich'in Comprehensive Land Claim Agreement. It represents a fundamental opportunity for Aboriginal peoples to determine, support and approve a project that is critical to self-determination and self-sufficiency. Surely, Mr. Chairman, this must be seen as being in the public interest.



1.2

What is the public interest?

On behalf of all Canadians, the National Energy Board must decide whether the project is in the public interest. Would Northerners and other Canadians be better or worse off if the project is approved? We consider the expected benefits of the project and the costs or negative impacts.

We are required to consider any public interest that may be affected, now and in the future, by granting or refusing the applications. Would Northerners and other Canadians be better or worse off if the project is approved? We consider the expected benefits of the project and the costs or negative impacts.

The project must meet high standards for safety, reliability and environmental protection. There must be enough natural gas, and enough demand for it, to ensure the pipelines will be used. Companies must have funds to build the project. Transportation fees charged by the pipeline owners must be reasonable. Other oil and gas companies must be allowed to use the pipelines.

Impacts may be environmental, social, cultural or economic, and they cannot all be measured in dollars and cents. Benefits and burdens are not distributed equally among Canadian citizens. People living near the project may experience the effects of barge and truck traffic, construction camps, work sites and excavation. There could be job opportunities for them, and they might gain access to affordable natural gas supplies. For some people in the region, the project could be positive, for others negative. Meanwhile, most Canadians would see only indirect effects of the project, such as increases in the nation's economic activity and natural gas supply. When there are negative effects, we consider whether they are temporary or permanent, and if there are ways to reduce the impacts. We look at all the effects together, which enables us to determine if the project would be part of a sustainable energy future for the North and Canada.

Grand Chief Sam Gargan
Dehcho First Nations
Yellowknife

April 15, 2010

The Dehcho Territory will be the region most impacted by the Mackenzie Gas Project. The greatest length of pipeline, almost 44 percent, will be through our region. Due to the road system and our location in the southern part of the Mackenzie Valley, the transportation of material by barge and road, the influx of construction workers and camps, the development of borrow pits, the clearing of the land and the social disruption of the project will impact us more than any other region.

While some Dene leaders in the Mackenzie Valley today believe that we are ready to support this new pipeline, we believe that a fair evaluation of the social, spiritual, political, economic status of our communities would not agree. That is evident even in the impacts of the proposal itself which resulted in some conflict among our leaders.

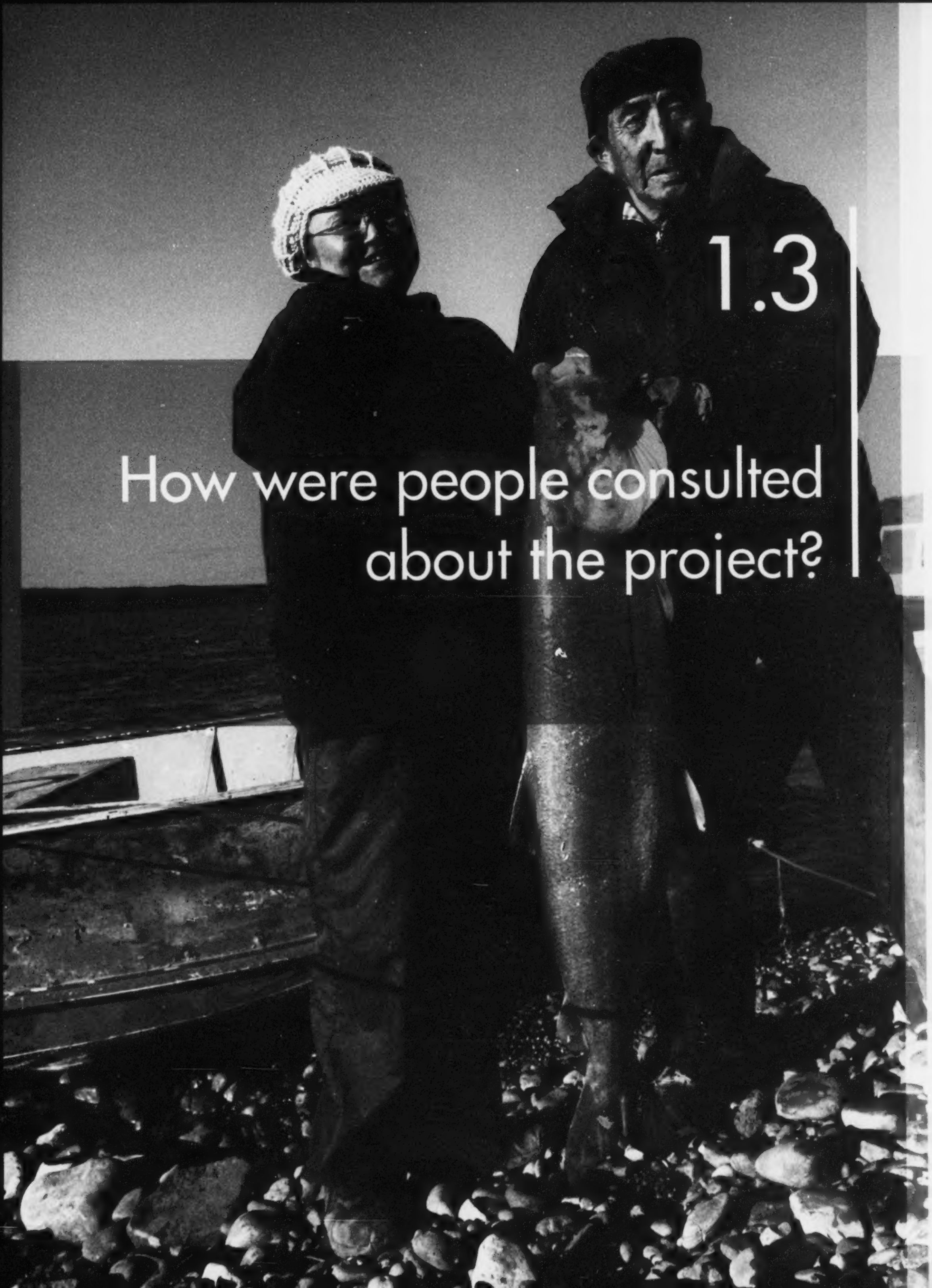
Joe Bernard
Tulita

June 1, 2006

I have almost 20 grandchildren, and I wonder what they will have to sustain them in future. And I want them to be capable to look after themselves in the future. And I hear a lot of people say that, too. And there are some people that will do well and some that will not. What will happen to those people?

It will be good if they did the careful planning in regards to this, and if we didn't do that, there would be not very many people that will benefit from this.

And it will be good if there's a lot of consideration put into this before any action is taken place. I'm talking for the grandchildren, and what we're talking about is something that is very significant and that we have to plan it carefully.



1.3

How were people consulted about the project?

We look at whether people who may be affected by the project have been adequately consulted. Companies must make sure that people are aware of the project and the application to the National Energy Board, and that their concerns have been addressed. The companies conducted more than 1,500 meetings with people in the North. Additionally, people were able to raise concerns directly with us during our hearing and that of the Joint Review Panel.

One of our important responsibilities is to make sure the companies consult thoroughly and properly with all affected parties. We heard directly from people in our 58 days of public hearings and also through the Joint Review Panel Report. The federal government addressed its obligations to Aboriginal people under Section 35 of the Constitution in a separate Crown consultation process.

The companies proposing the project committed to consult with people, communities, organizations, businesses and governments that would be affected. This consultation began during the planning stage and would continue throughout construction and operation if the project proceeds.

The companies began formally consulting with affected communities and other interested parties in early 2002. By that time, there had already been several studies and years of discussions regarding a possible project.

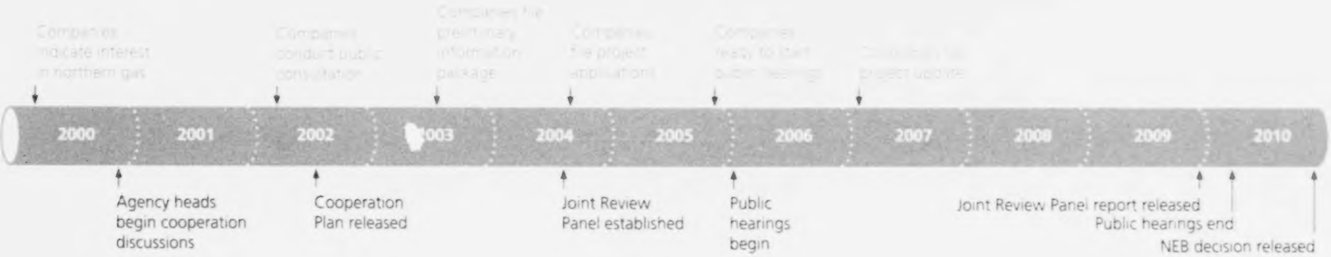
In the planning stage leading up to the application in 2004, project representatives provided information about the proposal. They met with individuals, communities and organizations to hear their concerns about potential social, economic and environmental effects.

Local and regional concerns led to more than a dozen significant changes in the planned route. Smaller alterations in locations and plans were also made. Some of the changes were made on the basis of Aboriginal people's traditional knowledge of the land. For example, the community of Tulita requested that the Great Bear River compressor station be located further away from the culturally significant Bear Rock. It was moved eight kilometres south, across the Great Bear River.

The companies said they could not make some of the requested changes due to cost, safety or technical reasons. In these situations, the companies said they looked for other ways to reduce the impacts. For example, where the route could not avoid crossing traditional camping or hunting areas, the construction schedule was changed to address some of the concerns.

Figure 1-4

Timeline of Mackenzie Gas Project regulatory review


Companies indicate interest in northern gas
Companies conduct public consultation
Companies file preliminary information package
Companies file project applications
Companies ready to start public hearings
Companies file project update
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
Agency heads begin cooperation discussions
Cooperation Plan released
Joint Review Panel established
Public hearings begin
Joint Review Panel report released
Public hearings end
NEB decision released

The companies' consultations included more than 1,500 meetings with northern residents and organizations. A separate team led a public participation program. This was part of preparing the project's Environmental Impact Statement.

Because 14 federal and territorial agencies, departments and regulatory boards have a role in managing environmental aspects of the project, the Joint Review Panel was established in 2004 to conduct a single environmental review. The Joint Review Panel held sessions in 25 communities, and its report was completed in 2009. The Joint Review Panel considered the social, cultural, physical and biological environments. National Energy Board member Rowland J. Harrison, Q.C. was a member of the Joint Review Panel. We considered the Joint Review Panel Report in reaching our decision.

Randy Ottenbreit
Mackenzie Gas Project
Inuvik

January 25, 2006

Charlie Tobac
Fort Good Hope

May 30, 2006

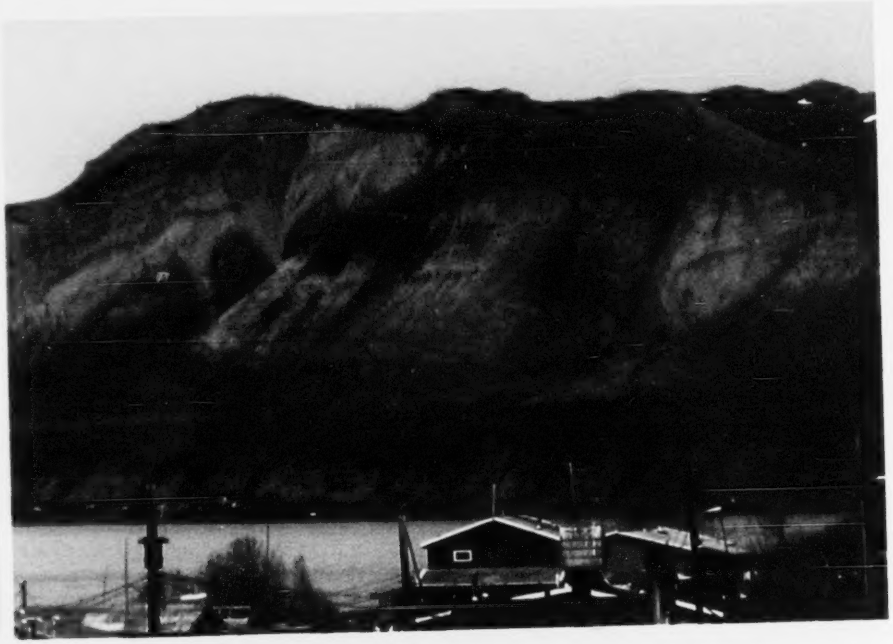
The National Energy Board and the Joint Review Panel heard directly from people in areas affected by the project along the Mackenzie River and in other communities such as Yellowknife and High Level. The National Energy Board public hearing began in Inuvik on January 25, 2006, and included sessions in 15 communities in the North. Our hearing ended in Inuvik on April 22, 2010.

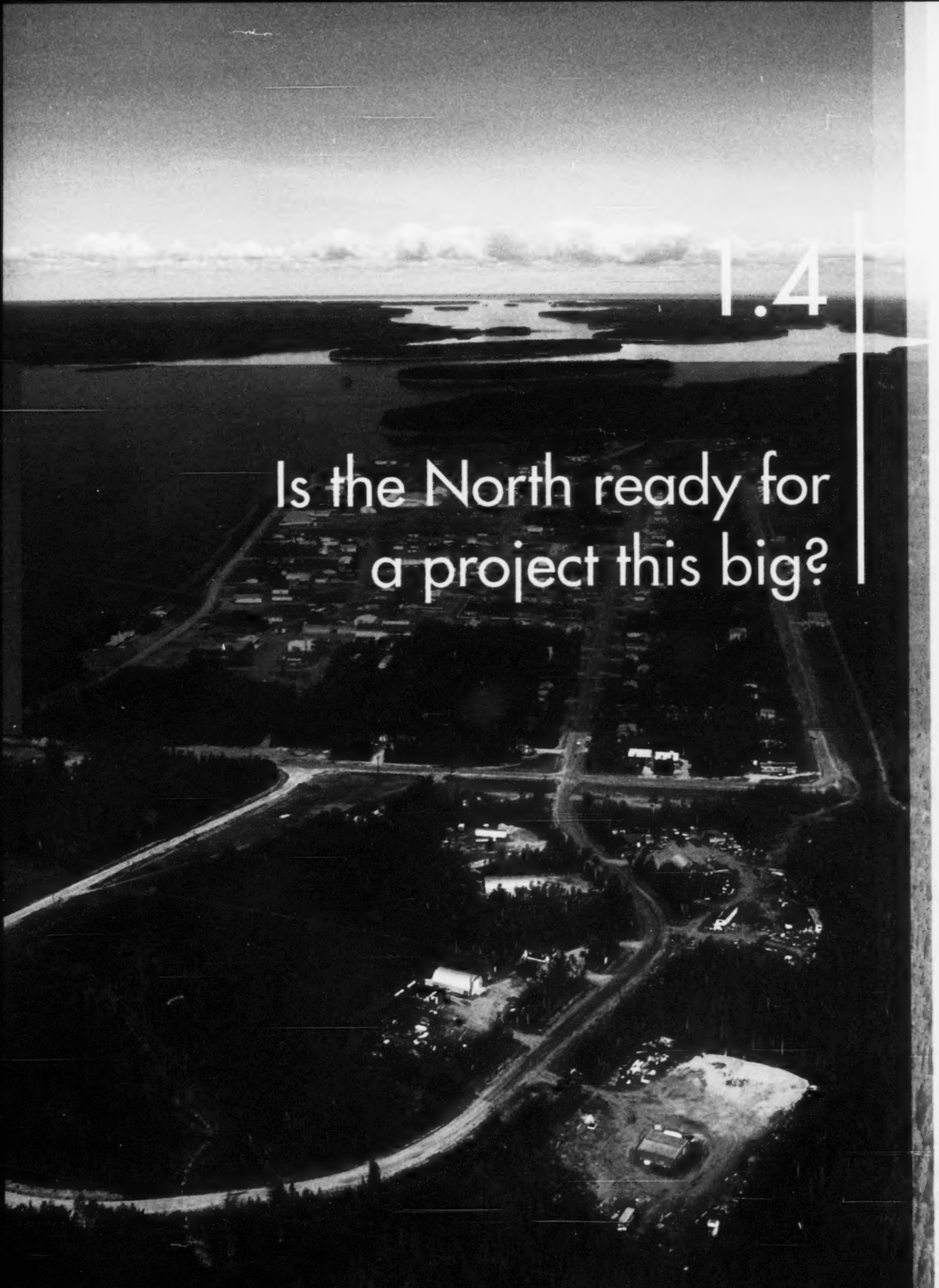
The Government of Canada provided funding to Aboriginal groups. This made it possible for them to hire experts and legal counsel, pay travel expenses, and participate fully in consultation and regulatory processes. This funding was in addition to funding the Mackenzie Gas Project provided to communities and Aboriginal groups.

Public participation was an essential component of our environment assessment process. Issue identification, impact assessment and the selection of environmental management measures utilize public input.

Public consultation provided an opportunity for external parties, including Northerners, to have their views heard early and through all planning stages to allow us to improve project decisions. The project consultation is not complete. Consultation will continue through the regulatory phase and throughout the life of the project.

This land is our home. It's like our mother. It feeds us, takes care of us, it makes us happy and teaches us about our responsibilities. If you do not know about the land, you will step on sacred grounds, and if you don't have this information, there's unknown risk, and so it is everybody's responsibility to make this right.





1.4

Is the North ready for a project this big?

The Mackenzie Gas Project would be the largest industrial development in Canada's North. Many people said they would welcome the economic opportunities, especially for young people. But Northerners also expressed concerns about effects on their culture and the environment.

The natural gas resources of the Mackenzie Delta area were discovered almost four decades ago. Taglu natural gas field was discovered in 1971, Parsons Lake in 1972, and Niglintgak in 1973. Additional drilling and seismic surveys showed the size of the natural gas fields. This led to several proposals in the mid-1970s for a pipeline to carry the natural gas to southern markets.

The federal government established a royal commission headed by Justice Thomas Berger to study social and environmental aspects of a Mackenzie Valley pipeline in the mid-1970s. After extensive hearings, Mr. Berger proposed a 10-year postponement of a natural gas pipeline along the Mackenzie Valley.

The National Energy Board also considered northern pipeline proposals in the 1970s. The National Energy Board approved the Foothills Pipe Line route for a natural gas pipeline from Alaska to Alberta along the Alaska Highway. The Foothills Pipe Line proposal also included a connecting pipeline following the Dempster Highway through Yukon from the Mackenzie Delta. After that, market conditions changed. More natural gas supplies were found in southern Canada and the United States, closer to consuming areas. Northern portions of the project were postponed indefinitely.

Some exploration continued in the Mackenzie Delta and the Beaufort Sea until the mid-1980s. The Norman Wells crude oil pipeline was completed in 1985. Following this, there was little oil and gas activity in the Northwest Territories. In the late 1990s, higher prices and rising demand for natural gas in southern markets again made it attractive to look for energy resources in the North.

The Mackenzie Gas Project would have much larger and more far-reaching effects than previous developments. It would bring a wave of construction activity on a scale never seen before in Canada north of the 60th parallel.

Nellie Cournoyea
Chair and Chief
Executive Officer
Inuvialuit Regional
Corporation
Inuvik

April 20, 2010

We cannot use what is not here to feed and support our families. We cannot use what is not here to provide the residents of our communities with the desirable standard of living that is the norm across most of Canada. In the absence of such opportunity, many of us must turn to government for support. This is not how we want to live. A community dependent upon government is ultimately not a stable or healthy community.

We want Inuvialuit to be self-reliant, holding satisfying employment and able to provide for their families' needs through their own efforts. We want our communities to enjoy the many benefits that accrue from a thriving and sustainable economic base. The Mackenzie Gas Project and the ongoing exploration and development that follow will provide such economic opportunity to not only the Beaufort Delta communities but also to other regions with the geology to support the presence of significant hydrocarbon resources.

Chief Peter Ross
Gwichya Gwich'in Council
Tsiigehtchic

December 6, 2006

Along with a project of this scale came many challenges. Some tend to focus on negative social impacts that will be felt in the communities, but often overlook the huge opportunity that this project will bring to the people. Much needed employment, training and education will become more available in the future with the signed Impact and Benefits Agreement and a $500-million Social Economic Fund to draw from.

We have a great deal to gain. The Gwich'in Nation wish to become self-governing as we were in the past. In order for this to become a reality, we need self-sufficiency. The only way we can achieve this, is with an economic base. Without a sound economic base to build from, we can never have a true self-government.

Facilities for the Ikhil gas field

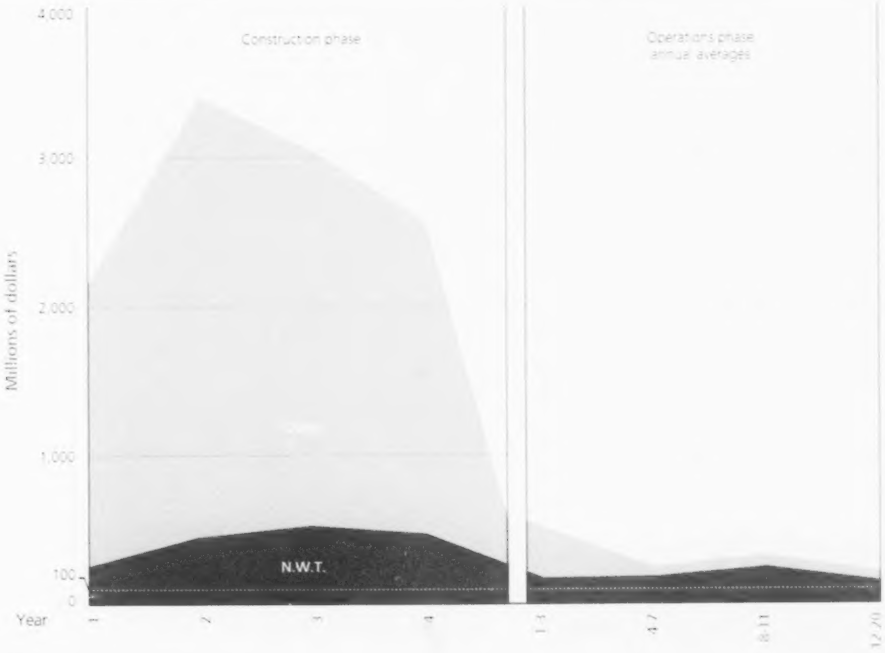
In 1999, a 50 kilometre pipeline was built from the Ikhil gas field northwest of Inuvik to supply the town with natural gas.

After construction, there would be continuing economic benefits from supplying the operation with goods and services. Cleaner-burning natural gas could replace diesel generators and oil heating in communities along the pipeline route. Pipeline and gas field operations would create some direct employment. However, project spending during operations would be much less than during construction.

We heard there could be negative effects on the society, culture, environment and economy of the North. Some people were concerned about problems such as drugs, alcohol and gambling, and the potential demands on police, medical and social services. Some worried about the loss of Aboriginal culture. There were concerns about impacts on fishing, hunting and trapping, traditional land use, parks and protected areas, and other effects on land, water and air, including global climate change.

Figure 1-5

Project expenditures



We also heard that much has changed in the decades since natural gas was discovered in the Mackenzie Delta. Some protected areas have been established and some land claims settled. Other claims are outstanding, and some land use plans are still being developed. Many Northerners told us that modern communications and transportation have exposed them to national and international culture, goods and services. They said an economic driver like the project could help residents to become more self-reliant, and they wanted to create opportunities for young people.

People told us that lifestyles are changing in the North. Three decades ago, many people supported themselves by hunting, fishing, trapping and gathering. Now almost everyone lives for most of the year in permanent communities. Fewer people rely on country food for most of their diet. People have greater access to television, telephone and internet services. More people have obtained education and occupational training, and more have worked, studied or travelled outside the region.

We heard repeatedly that it is very important Aboriginal rights be respected at every stage of the project. The Dehcho First Nations in particular indicated that their self-government,

Alestine Andre
Tsiigehtchic

December 6, 2006

> *We do not need a pipeline. It will create a lot of damage to the land and the people. Nobody can tell us that there will be no significant impacts on the land.*
>
> *The first piece of Mackenzie Gas Project machinery that uproots and unearths the moss, tearing away the topsoil just above the permafrost, will cause irreversible damage that will change the landscape and the boreal forest forever, not to mention the birds, the animals, the fish, the water, the air, and the Gwich'in people.*

Mary Teya
Fort McPherson

December 5, 2006

> *Our land is rich right now. We still have a lot of animals out there. We depend on the animals that live on the land. We depend on the fish in the river, the fish in the lakes, the caribou in the mountains, the berries on the land, the plants; everything is important to us. And can you tell me that all these things are going to continue to be there after all this work has been done? I understand it's going to be under water, under land, but how safe is that?*

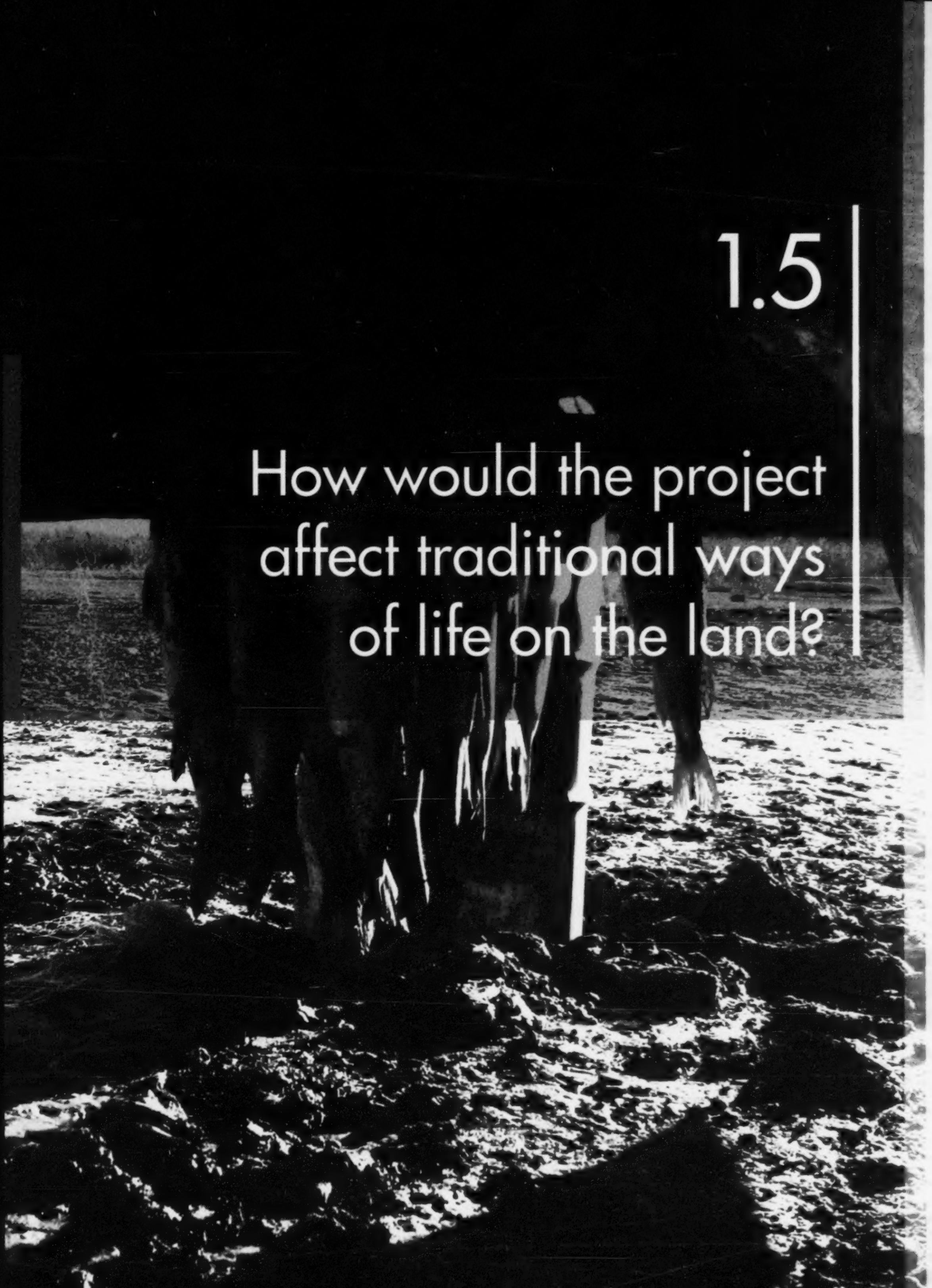
land claims and land use issues would need to be settled before they could support the project. These issues have been the subject of negotiation between the First Nations and the Government of Canada.

The federal government established the $500-million Mackenzie Gas Project Impacts Fund (also known as the Social Economic Impacts Fund). The fund is to compensate for the indirect effects the project could have. It would be distributed to Aboriginal communities over a 10-year period if the project went ahead. The fund would be divided among the five affected regions: Dehcho ($150 million), Gwich'in ($82 million), Tulita/Deline ($61 million), Inuvialuit ($150 million), and Kasho Gotine/Colville ($57 million). The Dene Tha' First Nation has also reached an agreement with the federal government that would provide $25 million funding for social and economic impacts from the project.

The companies and the government of the Northwest Territories signed the Socio-Economic Agreement for the Mackenzie Gas Project in 2007. The agreement outlines commitments that are intended to maximize benefits and mitigate negative impacts arising from the Mackenzie Gas Project for Northwest Territories residents. The Socio-Economic Agreement includes measures to address employment and training, social and cultural well-being, business, net effects on government, monitoring, reporting and adaptive management.

Under the *Canadian Oil and Gas Operations Act*, companies would submit benefits plans for the three development fields and the Mackenzie Gathering System. These would describe plans for the employment of Canadians and for providing Canadian manufacturers, consultants, contractors and service companies with a full and fair opportunity to participate on a competitive basis in the supply of goods and services. These plans would include provisions to maximize benefits to Northerners. Companies would be required to submit an annual report describing the actual training, employment and business benefits they created.

The companies noted that they have concluded benefits and access agreements for the Inuvialuit Settlement Region and for the Gwich'in and Sahtu Settlement Areas. The companies noted that such agreements have not been concluded for the Dehcho region, and stated they are committed to concluding benefits and access agreements for the Dehcho.



1.5

How would the project affect traditional ways of life on the land?

The cultural and spiritual life of Northerners depends on the health of the land, water, fish, birds and animals. Protecting the environment helps protect the traditional way of life. Strict conditions on the project would reduce impacts on the land and wildlife. Most construction would happen in winter far from northern communities. After construction, the project's activity would decrease. The pipelines would be buried, and the 40 or 50 metre wide right of way would be the biggest permanent presence on the landscape.

Fred Carmichael
Chairman, Aboriginal
Pipeline Group
Inuvik

April 20, 2010

Chief Jim Antoine
Liidlii Kue First Nation
Yellowknife

April 15, 2010

Snowmobiles, motor boats, air travel, and goods and services from outside the region have greatly changed traditional ways of life. Yet most Northerners have maintained a deep attachment to the unique environment in which they live. Their cultural and spiritual life centres on the land, water, plants, fish, birds and animals that have nurtured their ancestors for thousands of years.

Building the Mackenzie Gas Project would be a vast undertaking. Most of the activity would occur in winter far away from the places where people live. This would reduce the potential impacts. Most roads would be constructed with snow and ice on frozen soil. Construction workers would have little direct contact with local communities. Most activity would be confined to camps and construction work sites. Camps would be "closed"—that is, there would be no unplanned contact with local communities.

Once the pipeline system is in place, there would be relatively little activity except in the natural gas fields and at the gas processing plant and compressor stations. The 40 to 50 metre wide right of way for the buried pipelines would be the project's biggest permanent presence on the landscape. Direct effects of the project would occur mainly on the

Fred Carmichael *I have witnessed in my lifetime great changes; some good, some bad. What has been most difficult for me to watch was our way of life and our people changing from being proud, independent, self-sufficient people with our own hunting-trapping economy.*

I witnessed this loss in the late sixties and seventies and which was due mainly by southern influence such as the anti-fur movement. And today some of those activists are denying us the opportunity to become self-sufficient without offering us any viable alternatives.

As a result, we have become dependent on a southern industrial way of life, but with no industry or no long-term plan for economic stability for people of the North. Because of this, many of our people, through no fault of their own, are now dependent on the social welfare system.

For over 40 years we have been wandering in the wilderness, looking for a way once again to become economically self-sufficient and to regain self-respect and pride for our people today and for future generations.

We see the Mackenzie Valley Pipeline Project as the first step to regaining economic self-sufficiency. That's the reason why our leadership decided to take ownership in this project through the Aboriginal Pipeline Group.

Chief Jim Antoine *If you give the certificate to the proponents then what I'm hearing is that they're going to not make any decisions for some period of time. And what we need is time on the negotiation side. I don't know how much time. So negotiations are going on as we speak today, at Northern United Place, so there is some movement there.*

So we have to balance that and, as the Chief of Liidlii Kue First Nation, I have members there that are very in support of this. They try and do something on the pipeline side and then we have also other people who are saying that, "Wait a minute, we have outstanding Treaty issues here."

So my task would be to deal with that at the community level and I'm also part of the Dehcho First Nations so we discuss that at leadership meetings and give direction to the Grand Chief at that level.

Economic development for me and the communities is a key for the future and we have to also include that into the mix, and some meaningful economic development for First Nations, any development that comes into our own territory.

So whenever a project of this size is going to go into our territory, we have to benefit from it. So we have to get ourselves organized to—in any way possible to get organized. There is already work done with the Aboriginal Pipeline Group side, you know, so there is significant benefit in that arrangement, and there is also work being done on the construction side which, once construction is going to happen, it's going to go really fast. It may be three years at the max and there'd be a spike of activity.

Arthur Tobac
Fort Good Hope

May 30, 2006

The K'ahsho Got'ine people like most First Nations have a strong cultural attachment to the land. The land is the glue that binds our people. It defines our culture and it shapes our concept of community, and determines the basis of how we wish to govern ourselves.

right of way and in the immediate area around the natural gas fields, the gas processing plant and the compressor stations.

Some people were concerned about how the project might affect their ability to continue traditional hunting and trapping. For example, they said the project might fragment sensitive caribou habitat or affect migration patterns of geese. Some people said that helicopter traffic was already affecting their quality of life and could affect wildlife. Some worried about the amount of barge traffic that would be on the river and in the Delta region during the construction period.

One way to help sustain the traditional way of life is to prevent serious or permanent damage to the natural environment. The project would be required to meet strict conditions to avoid or reduce impacts on the land and wildlife. Special measures would be taken to protect wildlife, avoid sensitive habitat, and reduce disturbance to water bodies. Before construction, companies would develop Wildlife Protection and Management Plans and Environmental Protection Plans. The plans, once approved by the National Energy Board, would guide it in regulating the project throughout its lifespan. The National Energy Board and other agencies would conduct inspections, monitoring and audits to make sure the companies complied with the plans and all environmental commitments.

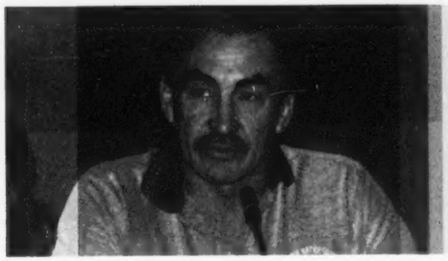
The employment and economic activity created by the project could affect traditional lifestyles. After construction, 66 percent or 205 of the 312 direct jobs per year would be filled from the local population. Also, there could be more people moving into the area from outside the region.

Some Northerners expressed concern that the project would open the area to future development and increase impacts on the land, wildlife and people. New applications and regulatory approvals would be required for future development.

James Pokiak
Tuktoyaktuk

December 4, 2006

I'll gladly support this pipeline if the environment and our wildlife is going to be there for our future generation. You know, being able to bring my children up out on the land made them realize also how important it is to them, to a lot of us. A lot of families still make use of that land in the springtime, summer, fall. We have four seasons that we do different activities, and I'm just hoping that this whole project doesn't destroy it for our future generation, you know, grandchildren. I would some day like to see my son and daughters take their children out, and their grandchildren, berry picking or fishing and enjoying time out there.



Alvin Yallee
Wrigley

October 3, 2006

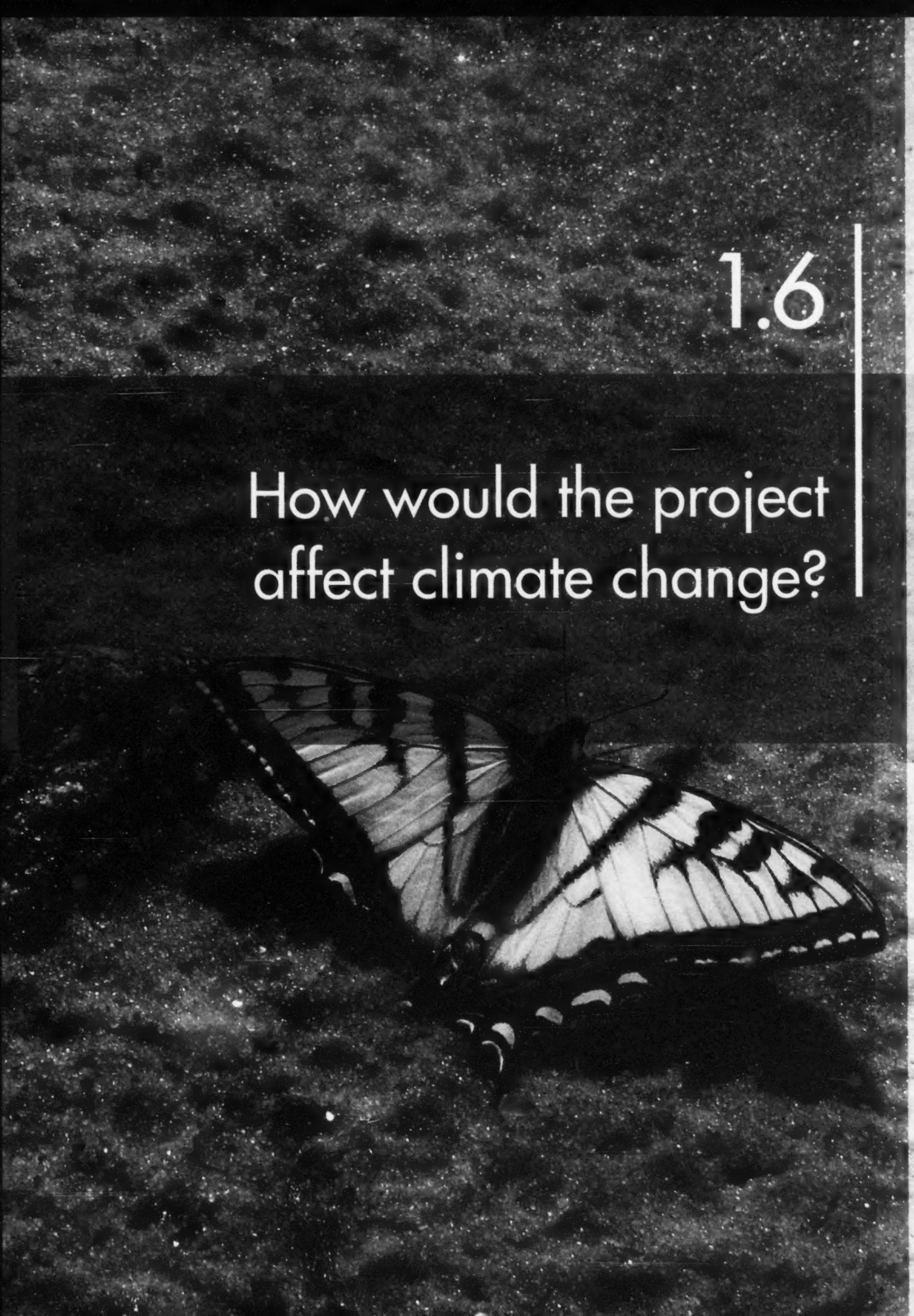
We care about our people, the effects the [Mackenzie Gas Project] will have with the disruption and what appears to be the eventual loss of our traditional way of life through assimilation into an industrialized world.

No, wait. The effects of the MGP on our community have already started. For example, this summer we have had countless helicopters flying over our community and territory doing countless studies. Our membership asks: Who, what and to what end? Granted, [Pehdzeh Ki First Nation] Band and council staff may know the specific mission of that specific helicopter, but let me assure you that nobody has a clear grasp on the cumulative effects of that endless chain of traffic. Our Elders only know that these helicopters make a lot of noise and are scaring the animals away.

This is only the tip of a very large iceberg. It is only the beginning.

1.6

How would the project affect climate change?



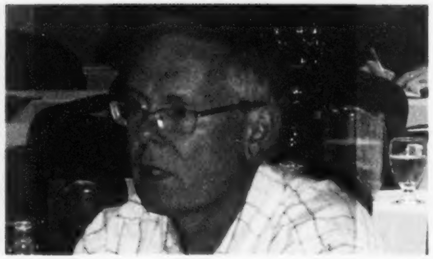
The project would directly increase Canada's greenhouse gas emissions by about 0.2 percent. A larger effect on climate change depends on how and where the natural gas is finally used. Total emissions in North America could increase, or they could decrease if the natural gas replaces more polluting energy sources.

Warming temperatures in the Arctic are directly related to greenhouse gases in the atmosphere. We heard many concerns about the project's potential effect on climate change.

The companies proposing the project estimated that up to 488 000 tonnes of carbon-dioxide-equivalent greenhouse gases would be released to the atmosphere each year during the three peak years of the construction period. Operations with three compressor stations

Don Davies
Counsel for Imperial Oil
Resources Ventures Limited
Yellowknife

April 12, 2010



Tony Grandjambe
Norman Wells

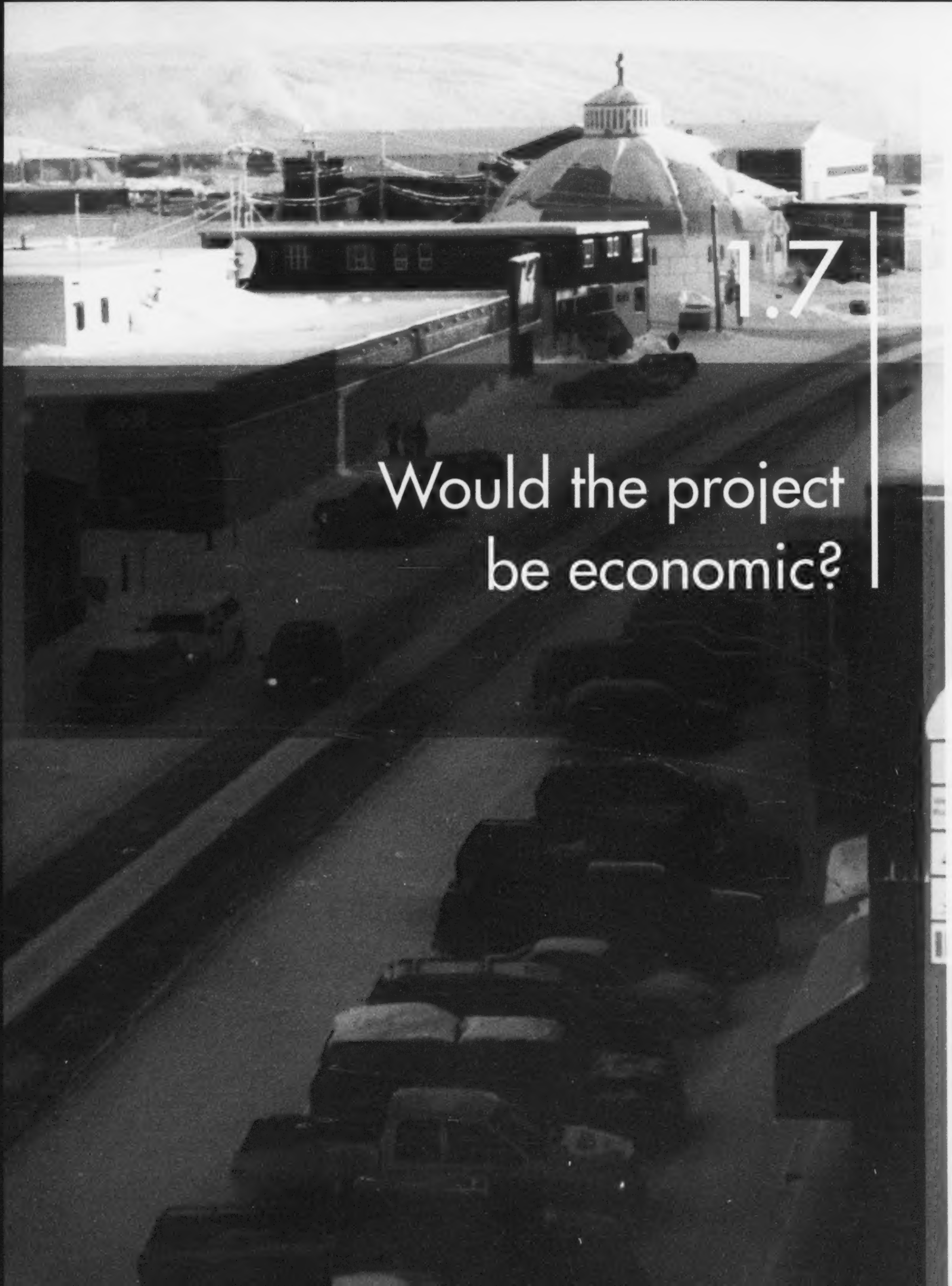
April 26, 2006

would result in average emissions of up to 1.4 million tonnes per year, or about 0.2 percent of Canada's total emissions in 2008. This would include emission sources from the production area, the pipeline corridor, construction activities, compressors, power generation for pipeline operation and process equipment, well testing, fugitive emissions, venting, and changes in land use. The peak emissions from operation with three compressor stations could be as high as about 1.9 million tonnes per year. To manage emissions the companies would use the oil and gas industry's best practices and the best available technology that is economical.

People were concerned about emissions from the Mackenzie Delta gas when it is burned. If that gas replaces coal or oil, total emissions might decrease. On the other hand, some witnesses argued that the gas could be used to produce fuels from the Alberta oil sands and that could increase total emissions. The companies said the gas would be destined for the overall North American market, not any particular use or gas-burning facility.

In the case of the Mackenzie Valley Pipeline, there is no direct connection between the MVP and any particular gas-burning facility. Mackenzie gas will be sold into markets throughout North America. On any given day, it could end up at commercial, residential, industrial or public facilities in many different locations in Canada or in the United States. There is no end-use facility that is contingent on the MVP.

I am neither for nor against the construction and production of natural gas and sweet natural gas fluids. This is a project that is needed not only here, but all over the world. One area of great concern to me is the increasing climactic changes to the environment, and it's escalating yearly and not by any means decreasing. I only pray that all precautions and considerations are taken seriously towards making a final decision.



1.7

Would the project be economic?

Before going ahead, the companies would have to decide whether the project is a good investment. This would be based on natural gas prices, markets for the gas, the amount of natural gas available, expected costs of transportation on the pipelines, and fiscal arrangements.

Kevin O'Reilly
Alternatives North
Yellowknife

April 13, 2010

The developers of the three gas fields have agreed to supply 23.5 million cubic metres (830 million cubic feet) per day of natural gas for the first 15 years of pipeline operation. This would fill 86 percent of the Mackenzie Valley Pipeline's capacity with one compressor station, or 69 percent of the capacity with three compressor stations. These companies have also agreed to contract for 4.7 million cubic metres (166 million cubic feet) per day of pipeline capacity in the following five years of operation.

The companies proposing the project said they expected oil and gas companies to begin developing other natural gas fields. They believed this would happen in the Mackenzie Delta and the Colville Hills region within three years of the pipeline starting operations. The second and third compressor stations would be added to increase pipeline capacity when needed.

One other company said it expected to contract for an additional 5.6 million cubic metres (200 million cubic feet) of pipeline capacity.

> *Given the large increase in natural gas supply in North America and Canada due to shale gas and liquefied natural gas, we're of a view that those sources could likely deliver the same or more gas than the Mackenzie Gas Project, more quickly and at a fraction of the cost. It is not good enough to say that the decision on economic viability lies with the Applicants alone, as the costs and impacts will be borne by taxpayers through the fiscal package or subsidies and by Northerners, who will bear the burden of the environmental and socio-economic costs.*

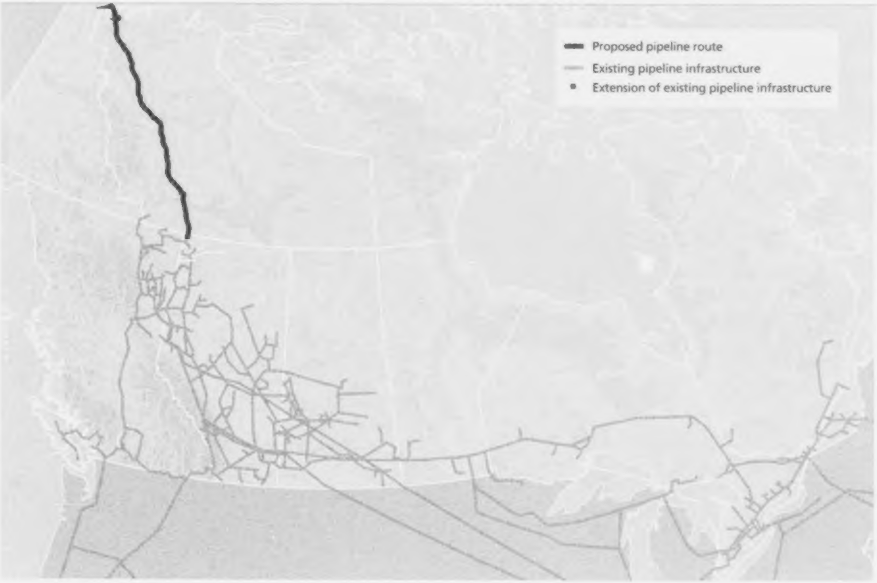

Proposed pipeline route
Existing pipeline infrastructure
Extension of existing pipeline infrastructure

Figure 1-6

Map showing connections to North American natural gas pipeline network

The companies proposing the project said there would be adequate demand for the natural gas because the pipeline would link to North American markets.

New facilities would be needed to move the gas from the end of the Mackenzie Valley Pipeline into the TransCanada Alberta System. The TransCanada Alberta System could accommodate 34.3 million cubic metres (1.2 billion cubic feet) per day, which is the maximum volume with three compressor stations. Higher volumes could require some additional pipeline capacity on the TransCanada Alberta System.

The National Energy Board would regulate tolls (transportation charges) on the gathering system and pipeline. Tolls would be based on operating costs, recovering the costs of construction, taxes, and a return on investment.

The companies have not decided whether the project makes economic sense to them. They would decide that at the end of 2013 based on many factors including natural gas prices, markets for the gas, the amount of natural gas available, the expected costs of transportation on the pipeline, financial conditions and the cost of complying with all regulatory requirements.

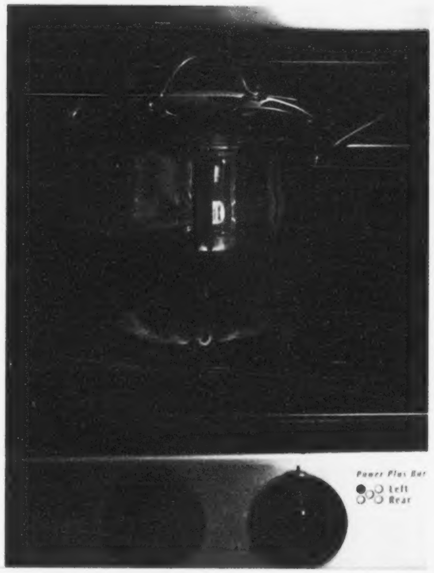
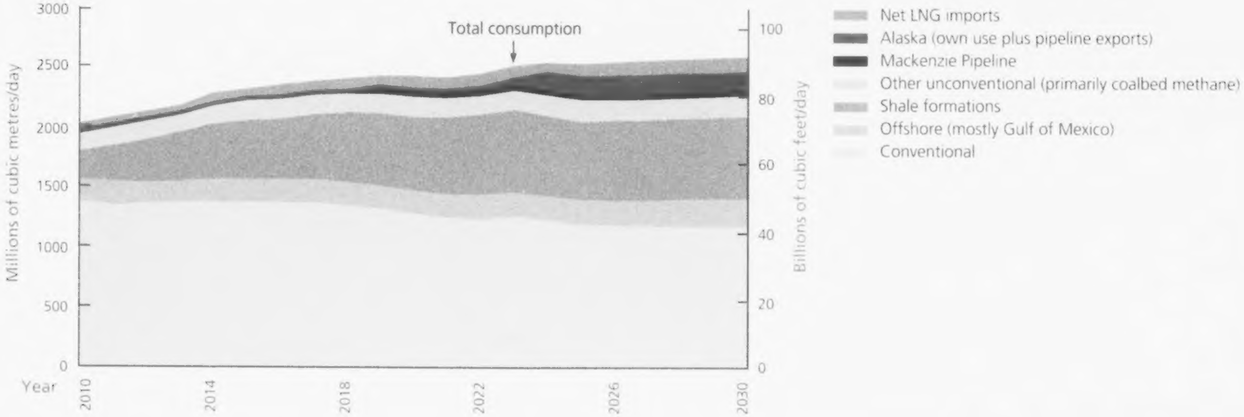


Figure 1-7

Projected North American natural gas supply and consumption



Dr. Gerald Angevine
Economist
Yellowknife

March 29, 2010

What this market study demonstrates is that there is room for gas from the northern frontiers in spite of increasing shale production and LNG being made available, being utilized as well. It does not indicate whether Mackenzie gas or Alaska gas for that matter would be competitive. That would be up to the producers at the time to determine.

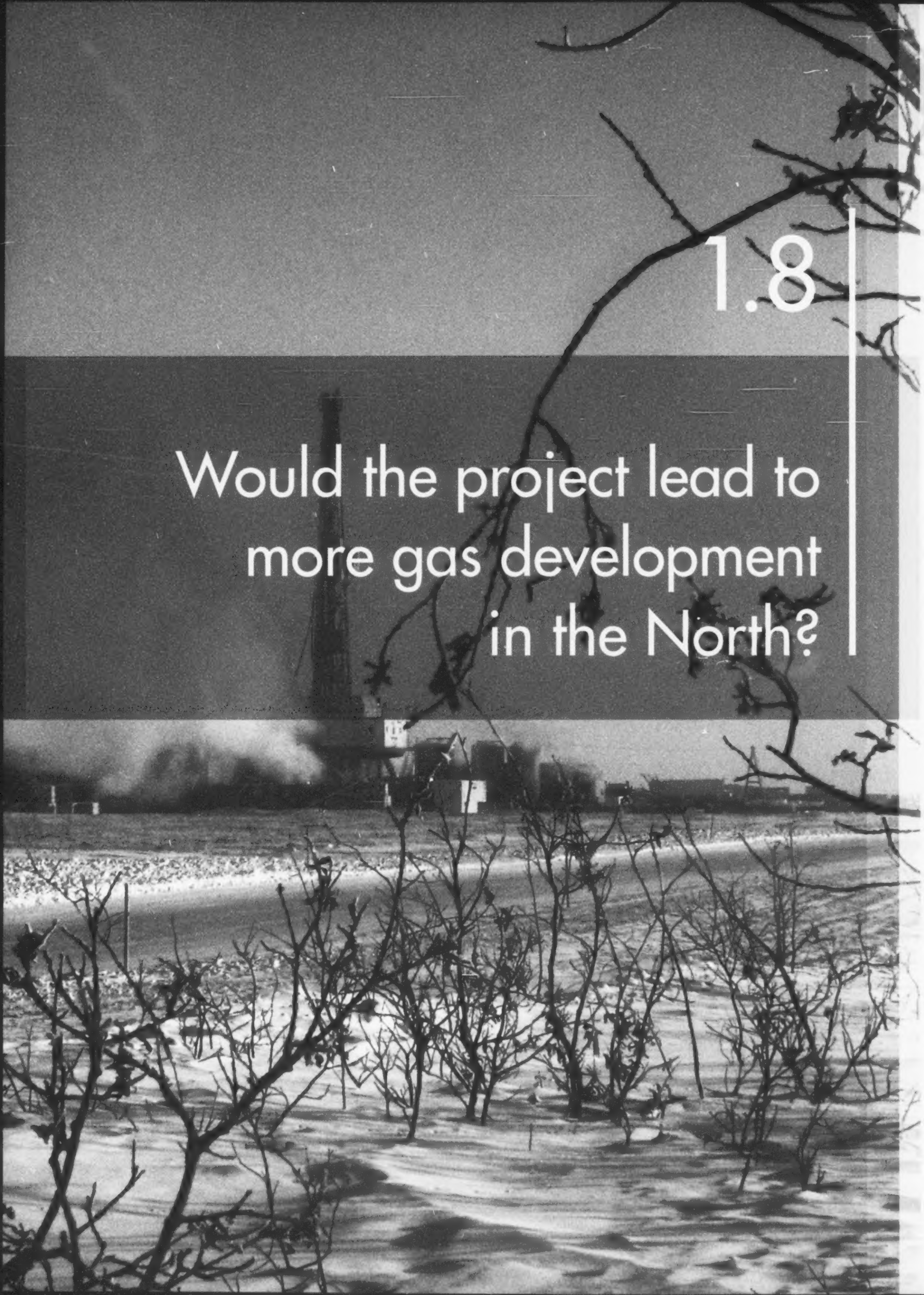
Heather Marreck
Imperial Oil Resources
Ventures Limited
Yellowknife

July 29, 2006

Ultimately, after these proceedings are concluded and we understand all the terms and conditions that are attached with the certificate—if we're issued one—as well as the updated information at that time around markets and our costs and schedules, we will make a decision whether we are going to proceed…

The volume of gas that's going to flow on the pipeline is one of the key factors in the setting of the tolls, and so it will have an impact on the economic viability of the field development.

We continue to be hopeful that we will have additional gas development prior to making the decision to construct, and that certainly would be a positive factor in our decision. But I couldn't tell you today whether or not we'd be able to go forward with the project if we don't have any additional gas.



1.8

Would the project lead to more gas development in the North?

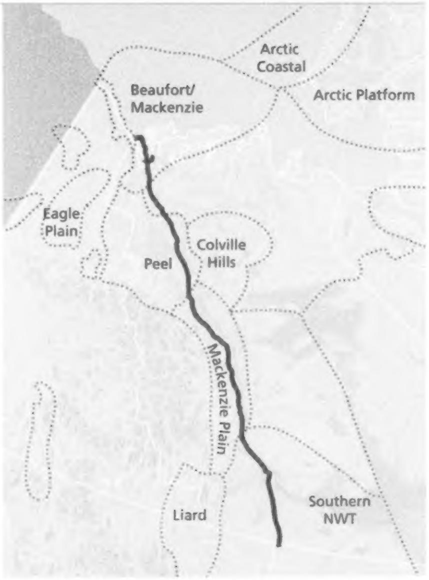
This application deals only with the three natural gas fields and the related pipelines and facilities. Any additional development may or may not be approved after new consultation, environmental assessment and regulatory review.

The contracted amounts from the three anchor fields would not fill the pipeline to its capacity. Many parties said they expect further natural gas development if the Mackenzie Gas Project is built. An outlet to southern markets could encourage oil and gas companies to explore and develop natural gas fields in the Mackenzie Delta, the Beaufort Sea, the central Mackenzie Valley, and possibly in Yukon. Consultation, environmental assessment and regulatory reviews would be required before additional fields could be developed.

There could be many natural gas fields in the Mackenzie Valley region. Gas has been found in the Colville Lake area and other parts of the Northwest Territories. Several significant gas discoveries have been made onshore close to the anchor fields. There was also a significant gas discovery in shallow waters (less than 100 metres deep) in the Beaufort Sea. A Yukon government study indicated that gas production from the Eagle Plain region could also be possible with high enough natural gas prices and pipeline access to markets.

Figure 1-8

Map of sedimentary basins



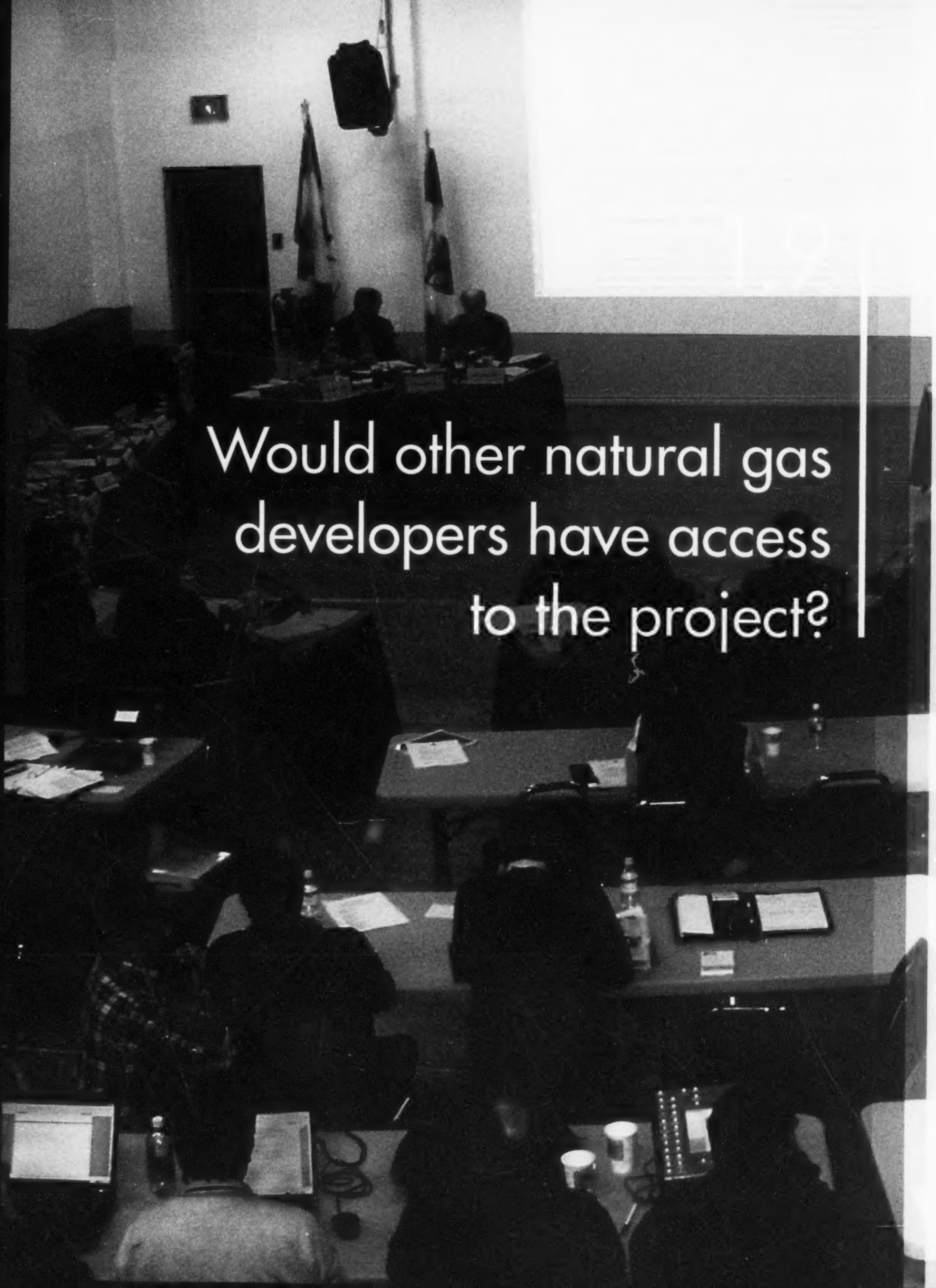
Joseph Kochon
Colville Lake

November 27, 2006

About five years ago, our Elders advised our leadership to create some opportunities for our young people; most importantly, to do everything ourselves.

One thing our Elders didn't say is how we should create these opportunities; therefore, it has given the leadership the mandate to explore ways of creating opportunities. And one of those opportunities became exploration for oil and gas in the Colville Lake area, which has been a successful one considering we picked a good business partner.

This project has opened many opportunities for our community and the surrounding communities; therefore, we see ourselves involved in some very interesting future potential projects, such as either transporting the successful wells to the proposed Mackenzie Gas Pipeline or find another economic potential for our interests in the current discoveries in the Colville Lake area.



Would other natural gas developers have access to the project?

Other companies are exploring for natural gas in the region. They would want to ship the gas they find on the Mackenzie Valley Pipeline. They would have a right to use the gathering and transmission pipelines, but they were concerned about conditions for using them and the possible transportation costs. They also expressed concern about the capacity of the gathering system north of Inuvik.

If the Mackenzie Gas Project is built, it would be the first link from the Mackenzie Delta to southern markets. It could be the only means to move natural gas out of the region.

We heard many concerns about how other gas companies would get access to the system. They were concerned about the amount of capacity that would be available on the pipeline. Exploration companies told us that the Mackenzie Valley Pipeline would be large enough to carry the natural gas they expect to find. However, they were concerned that the upstream gathering system might not have enough capacity for additional natural gas.

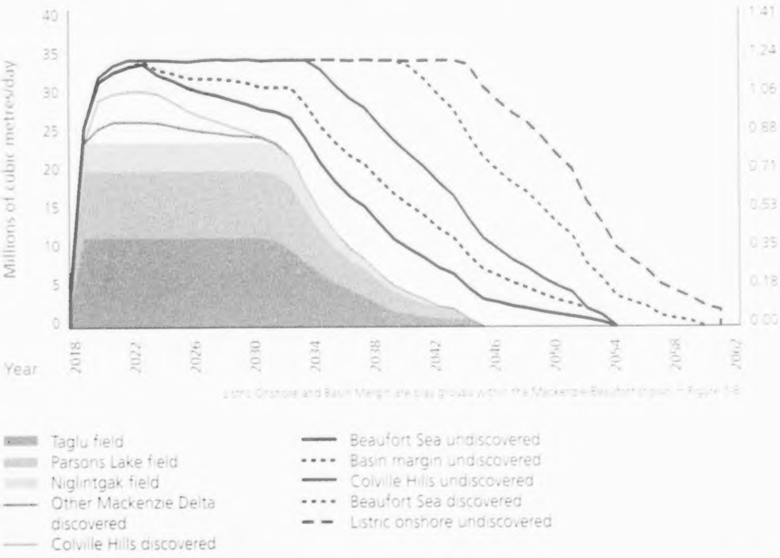
Other oil and gas companies were also concerned about the fairness of shipping terms and conditions. The proposed method of tolling for the gathering system was criticized for its lack of transparency. Some parties believed it was biased in favour of the system owners.

For the Mackenzie Valley Pipeline, there were concerns about the number of toll zones and how the tolls would reflect the cost of any future additions to the pipeline.

The project proposal calls for two toll zones. Shippers of gas from Inuvik would pay the full toll. For gas that comes into the system south of Little Chicago, such as from Colville Hills, shippers would pay 72.4 percent of the full rate.

Figure 1-9

Production from anchor fields and potential future developments



Listric Onshore and Basin Margin are play groups within the Mackenzie-Beaufort shown in Figure 1-8

Brendan Bell
Minister of Industry,
Tourism and Investment,
Government of the
Northwest Territories
Inuvik

December 11, 2006

Our support is conditional on the factors that we've laid out here before you a number of times today; that it be basin-opening; that it be done in an environmentally and economically sustainable manner... [W]e view any development through the lens of our sustainable development. policy. So there are a number of conditions that we place on this development...

We consider each development, each project on a case-by-case basis. We put a lot of faith in our regulatory process and in the Northerners who have a vested interest in how this unfolds who make up those boards. So each of these induced developments, as you say, will be considered on that basis, case by case.

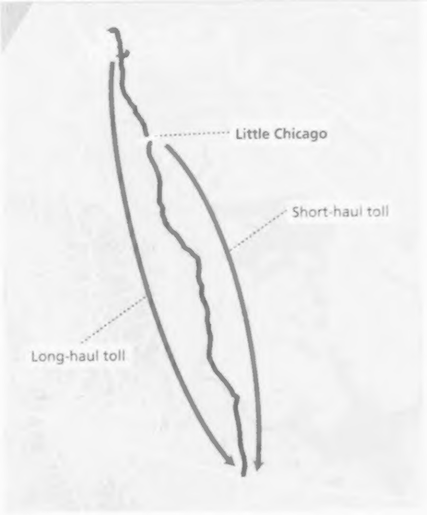
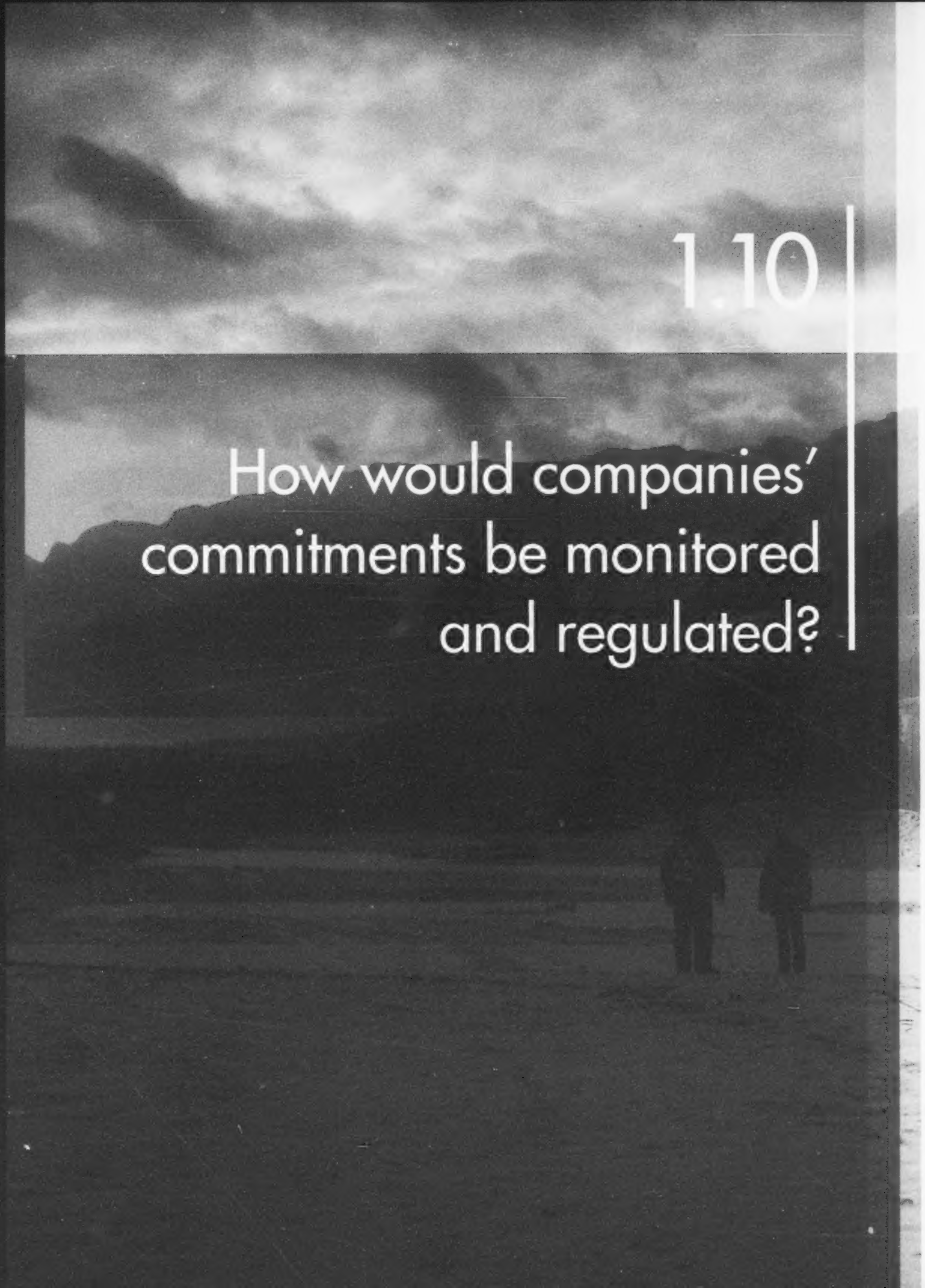


Figure 1-10

Proposed toll zones for the Mackenzie Valley Pipeline

Small-volume natural gas users in the Northwest Territories would benefit from rebates. The rebates would effectively reduce the toll by 50 percent of the full rate for shippers selling to these users.



1.10

How would companies' commitments be monitored and regulated?

The National Energy Board and other authorities would regulate every stage of the project. This starts at the time of planning, covers construction and operations, and ends after the pipeline is no longer useful. The National Energy Board would conduct audits and inspections to ensure that the companies honour their commitments. It would also investigate incidents and respond to complaints.

Monte Hummel
World Wildlife Fund – Canada
Inuvik

April 20, 2010

Some people at our hearing wanted to ensure that plans for monitoring and regulating the Mackenzie Gas Project would be honoured. This was a particular concern because much of this project's design was conceptual, and detailed engineering plans would only be developed if the project is approved.

All detailed designs would be reviewed by the National Energy Board and other federal and territorial regulators. Each stage of construction, operation and abandonment would be subject to regulation and enforcement.

From the very beginning, WWF has not been opposed to the Mackenzie Gas Project. It is not our goal to impede, obstruct, or to stop economic development in the North.

Rather, we respect the decisions of Northerners as to whether they ultimately want such projects. After all, they are the ones and the people most directly affected. It is the people who live in the North who will live with the project consequences, both positive and negative.

Further, WWF fully appreciates Fred Carmichael's point that many northern leaders would prefer the challenges associated with new economic development rather than the challenges they face without it—but not at any price.

Danny Bayha
Deline

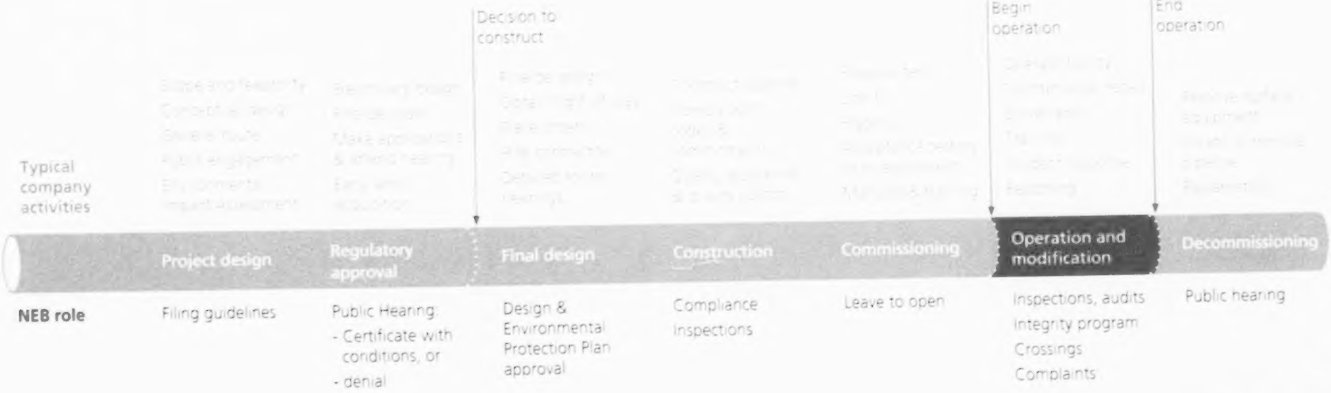
October 2, 2006

How are the concerns of the community going to be put into the project in the end? How can they be assured somebody is listening to what they're saying?

Who is going to look after the pipeline when it's built? How are they going to do that? Who is the police? Who is going to be looking after to make sure some of this stuff doesn't happen?

Figure 1-11

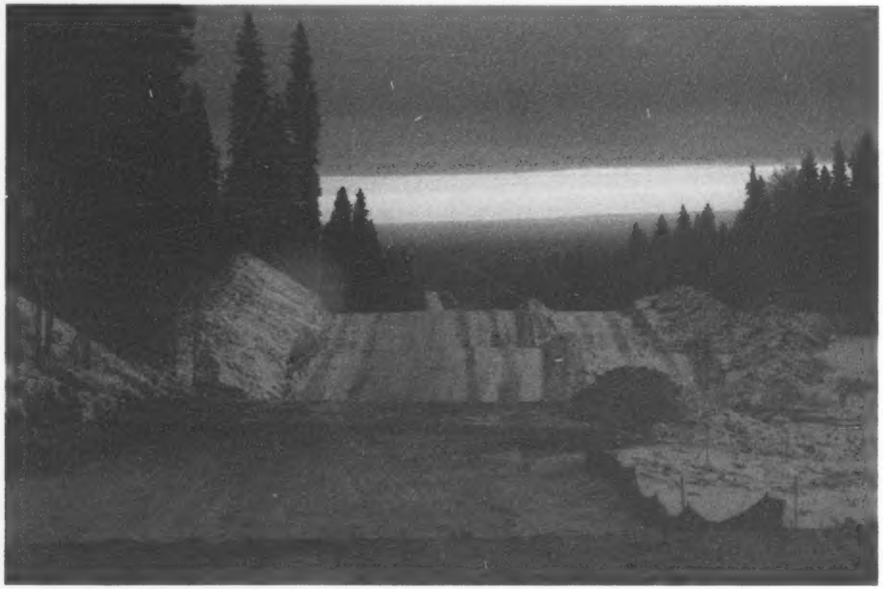
Timeline of "cradle to grave" lifespan regulation


Decision to construct
Begin operation
End operation
Typical company activities
Project design
Regulatory approval
Final design
Construction
Commissioning
Operation and modification
Decommissioning
NEB role
Filing guidelines
Public Hearing:
- Certificate with conditions, or
- denial
Design & Environmental Protection Plan approval
Compliance inspections
Leave to open
Inspections, audits
Integrity program
Crossings
Complaints
Public hearing

The companies have committed to frequent inspection and monitoring to ensure safe and reliable operation. Special attention would be needed because of the sensitive environment and the permafrost along the route. Ongoing monitoring would identify potential problems.

In addition, the National Energy Board would conduct audits and inspections. We would make sure the pipeline companies comply with regulations, their commitments and the conditions of approval. The National Energy Board investigates incidents and complaints and has processes to resolve complaints and disputes.

When pipelines and related facilities are no longer needed, they must be retired. This is called abandonment. It usually involves removing surface facilities, plugging wells, and reclaiming land that has been disturbed. Buried pipes may be removed or left in place depending on the best way to address safety, land use and environmental concerns. The operators must apply to the National Energy Board and other agencies for authorization to abandon their facilities. These applications are subject to public consultation, hearings and environmental assessment at that time.



Gabe Hardisty
Dehcho Elder
Yellowknife

April 15, 2010

And every time when we talk about things, we're not talking of ourselves. We're talking about the future of our children and we need to make sure that things are going to be better for our children in the long future and we don't want anything sitting wrong for our children in the future. Those are the reasons why we talk and we need to look into the future for our children and just so things will be better for us after we're gone and when our children are left behind.

Danny Gaudet
Deline

October 2, 2006

There needs to be a way to get people involved in monitoring these projects alongside with the scientists from the businesses or the governments.

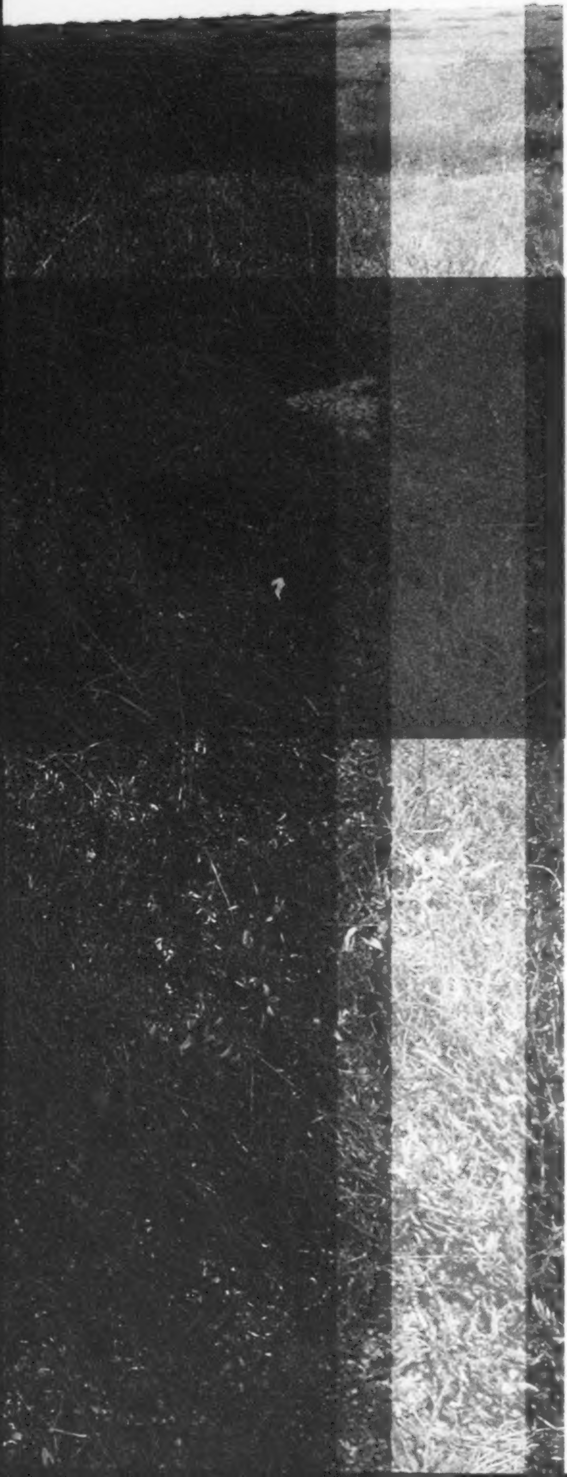
There needs to be a way of measuring impacts. And if there's impacts, negative or positive, measure them. If they're negative, slow down the project or even stop it until it's rectified, and then continue to go forward.

People are tired of the old way where resources were exploited from the area, and we have messes to deal with now, and we're the ones that have to contend with those messes.

MDSRC
SPILL EQUIPMENT

Part 2

Production, gathering and processing systems



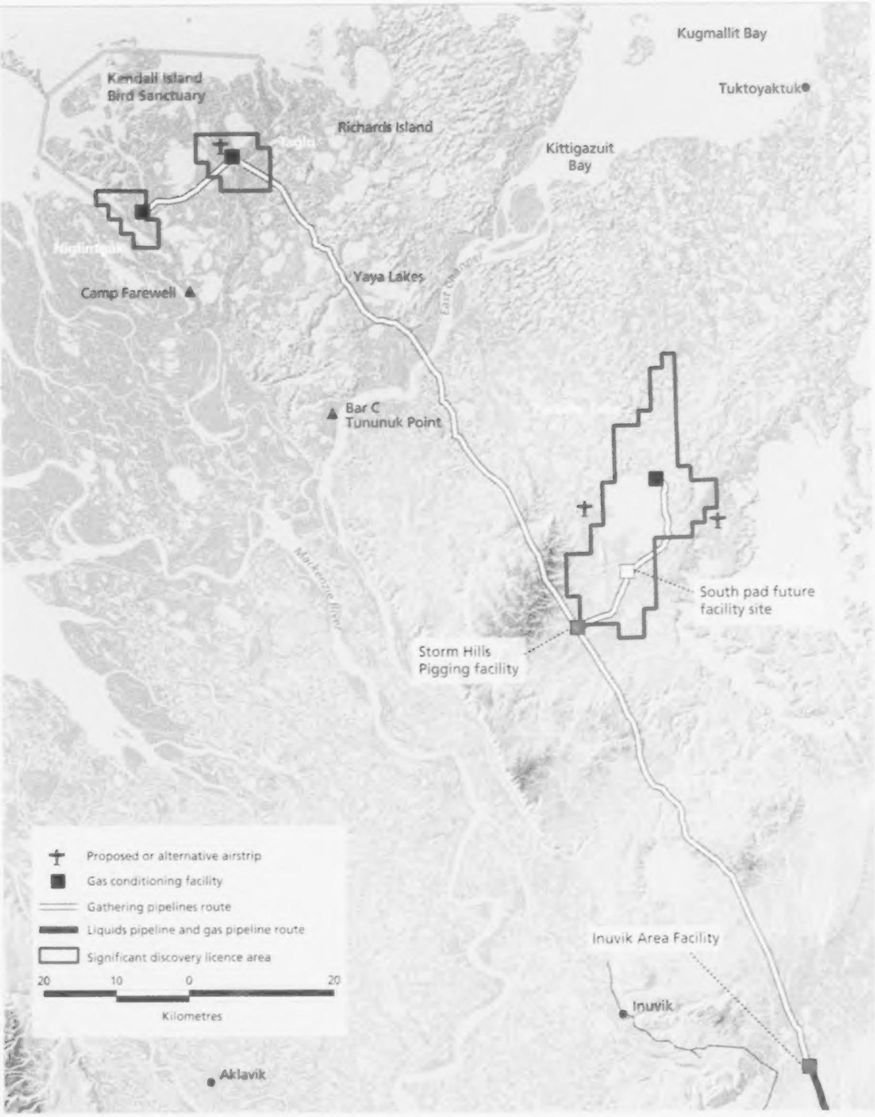
2.1

Where will the gas come from?

The Niglintgak and Taglu natural gas fields are located in the Mackenzie Delta. The Parsons Lake field is on the Tuktoyaktuk Peninsula. The natural gas would be shipped through gathering pipelines to the Inuvik Area Facility for processing. This facility would separate natural gas liquids from the gas that goes into the Mackenzie Valley Pipeline.

Figure 2-1

Map of the producing fields


Kugmallit Bay
Tuktoyaktuk
Kendall Island Bird Sanctuary
Richards Island
Taglu
Kittigazuit Bay
Niglintgak
Camp Farewell
Yaya Lakes
East Channel
Bar C Tununuk Point
Mackenzie River
South pad future facility site
Storm Hills Pigging facility
Inuvik Area Facility
Inuvik
Aklavik
Proposed or alternative airstrip
Gas conditioning facility
Gathering pipelines route
Liquids pipeline and gas pipeline route
Significant discovery licence area
20
10
0
20
Kilometres

The gas fields

Three separate natural gas fields would provide the initial natural gas supply for the Mackenzie Gas Project. The Niglintgak and Taglu fields are in the Mackenzie Delta near the Beaufort Sea. Parsons Lake is just east of the Delta on the Tuktoyaktuk Peninsula.

Facilities in the fields would remove water from the raw natural gas. Chilled gas would be shipped through the gathering system to the Inuvik Area Facility for processing. The gathering system and gas processing facility near Inuvik would be owned by a joint venture of the producing companies, with Imperial operating the facility.

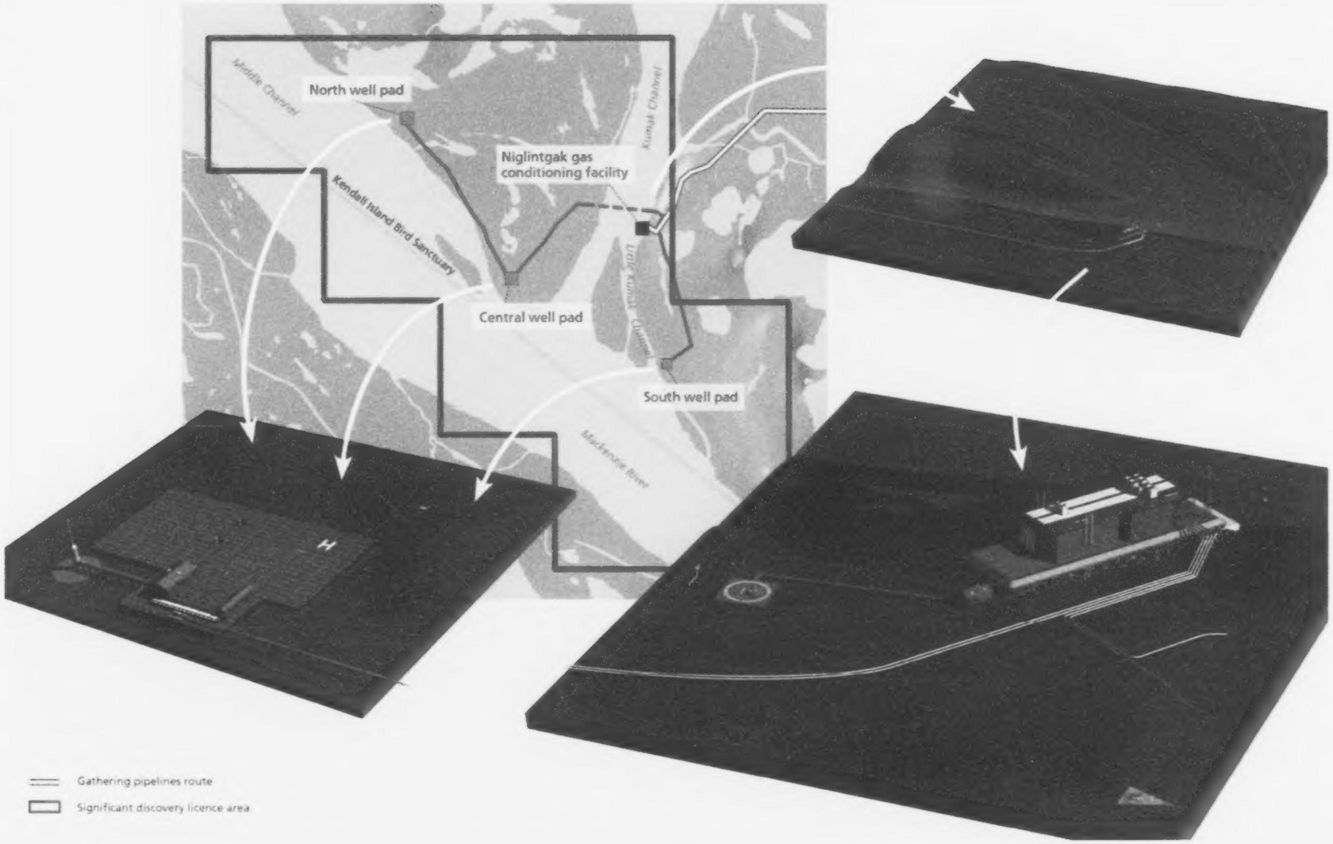

Middle Channel
North well pad
Kumak Channel
Niglintgak gas conditioning facility
Kendall Island Bird Sanctuary
Little Kumak Channel
Central well pad
South well pad
Mackenzie River
H
Gathering pipelines route
Significant discovery licence area

Figure 2-2

Niglintgak production facilities

Shell Canada's Niglintgak field is about 120 kilometres northwest of Inuvik. Here Shell plans to build:

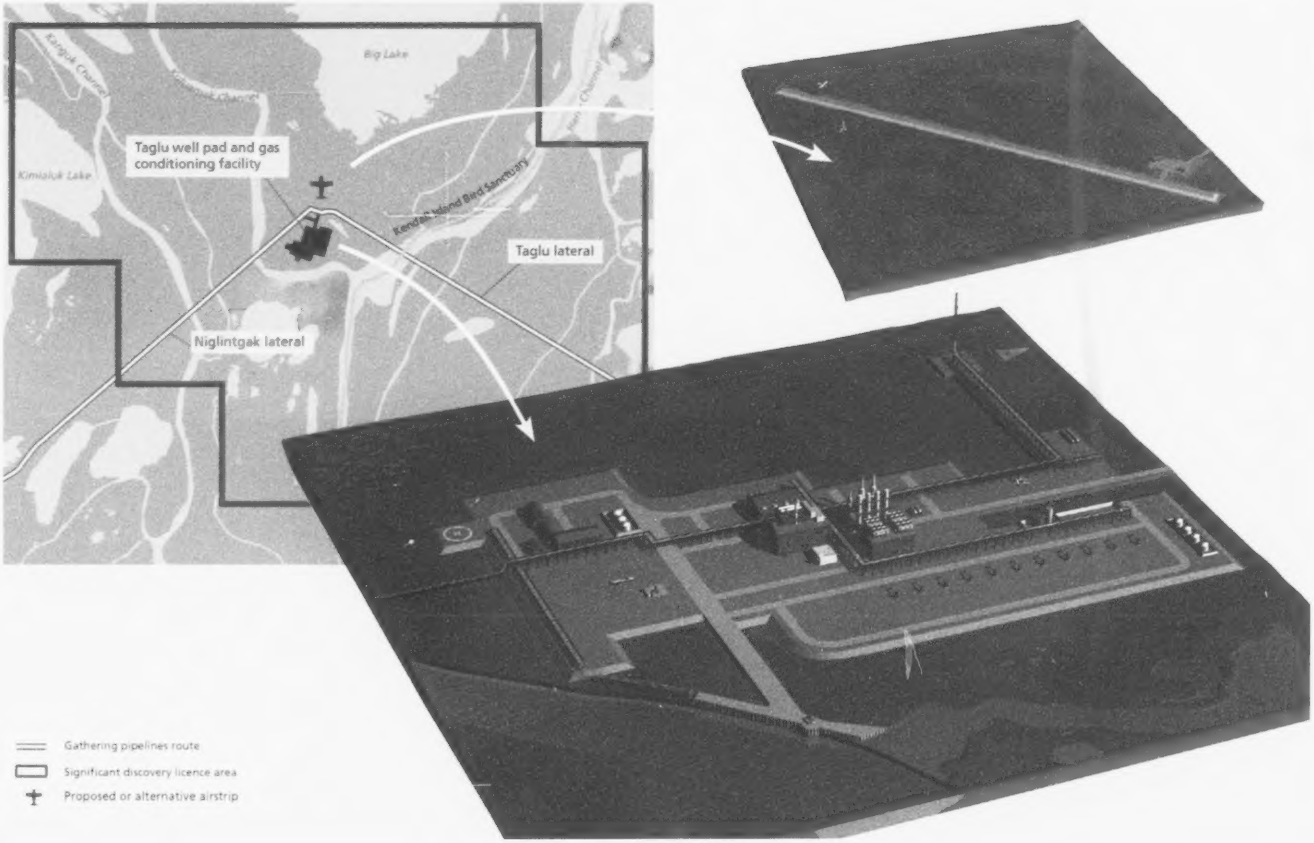
- 6 to 12 production wells located on three pads;
- a system of above-ground flow lines;
- a gas conditioning facility in the Little Kumak Channel;
- a disposal well;
- an emergency shelter; and
- helipads.

Figure 2-3

Taglu production facilities

The Taglu field, to be developed by Imperial Oil Resources Limited, is about 15 kilometres east of the Niglintgak field. Here Imperial plans to build:

- 10 to 15 production wells drilled from a single well pad;
- one or two disposal wells;
- a gas conditioning facility;
- a barge landing site;
- an airstrip;
- a helipad;
- several buildings; and
- a water treatment system.


Kanguk Channel
Big Lake
Kimialuk Lake
Taglu well pad and gas conditioning facility
Kendall Island Bird Sanctuary
Taglu lateral
Niglintgak lateral
Gathering pipelines route
Significant discovery licence area
Proposed or alternative airstrip

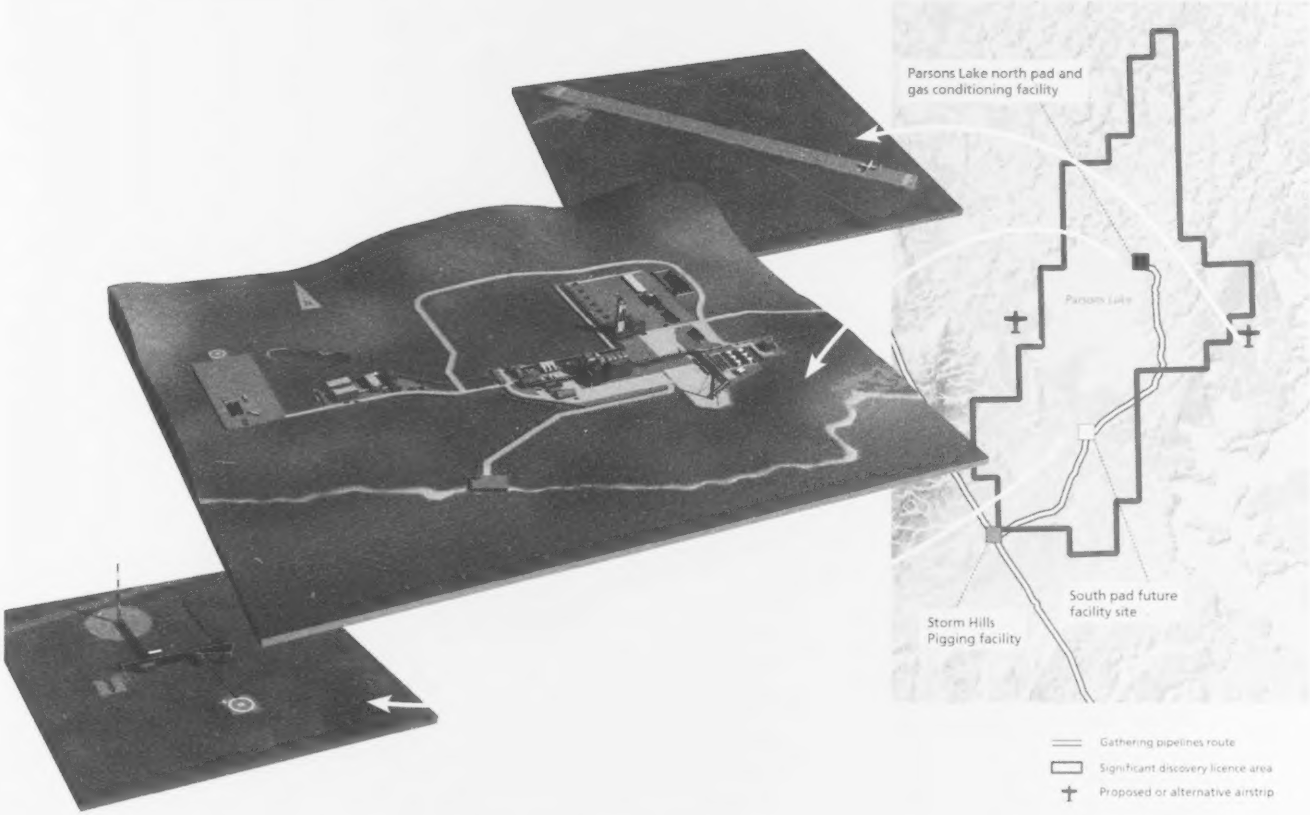

Parsons Lake north pad and gas conditioning facility
Parsons Lake
South pad future facility site
Storm Hills Pigging facility
Gathering pipelines route
Significant discovery licence area
Proposed or alternative airstrip

Figure 2-4

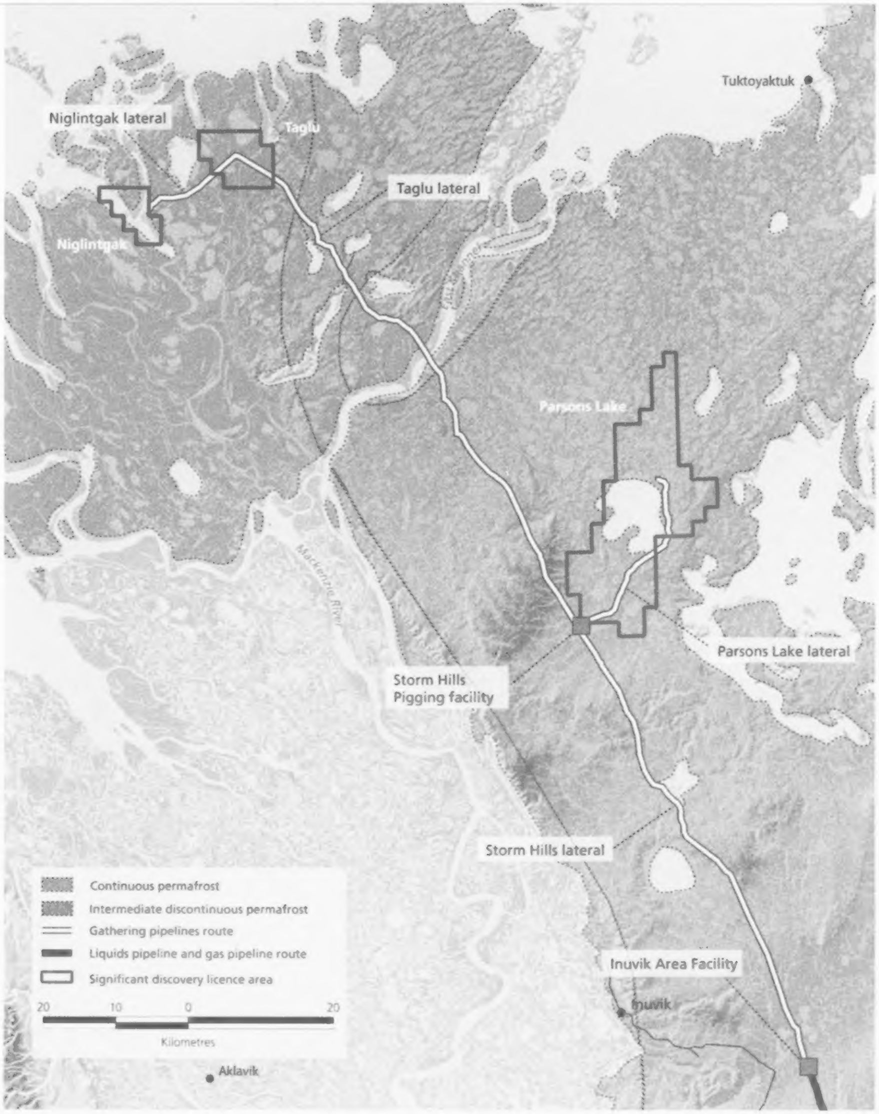
Parsons Lake production facilities

The Parsons Lake field, about 70 kilometres north of Inuvik and 55 kilometres southwest of Tuktoyaktuk, would be developed by ConocoPhillips Canada (North) Limited and ExxonMobil Canada Properties. ConocoPhillips is the operator of the field. They plan to build:

- a north pad with nine to 19 production wells;
- a south pad with three to seven production wells;
- disposal wells;
- flow lines;
- a gas conditioning facility; and
- related facilities including an all-weather airstrip.

Figure 2-5

Map of the gathering and processing system showing permafrost distribution


Tuktoyaktuk
Niglintgak lateral
Taglu
Taglu lateral
Niglintgak
Parsons Lake
Mackenzie River
Parsons Lake lateral
Storm Hills Pigging facility
Storm Hills lateral
Inuvik Area Facility
Inuvik
Aklavik
Continuous permafrost
Intermediate discontinuous permafrost
Gathering pipelines route
Liquids pipeline and gas pipeline route
Significant discovery licence area
20
10
0
20
Kilometres

Gathering system and gas processing facility

The gathering system would include four sections of buried pipeline:

- Niglintgak to Taglu—14.7 kilometres of 400 millimetre (16 inch) diameter pipeline in a 30 metre right of way;
- Taglu to Storm Hills—80.9 kilometres of 650 millimetre (26 inch) diameter pipeline in a 40 metre right of way;
- Parsons Lake to Storm Hills—26.4 kilometres of 450 millimetre (18 inch) diameter pipeline in a 30 metre right of way; and
- Storm Hills to Inuvik Area Facility—67.2 kilometres of 800 millimetre (32 inch) diameter pipeline in a 40 metre right of way.

At Storm Hills, about 50 kilometres north of Inuvik, the pipeline from Parsons Lake would join the pipeline from the Niglintgak and Taglu gas fields. The Storm Hills Pigging Facility would have pig receivers and pig launchers for removing and inserting "pigs" into the pipeline. These devices are sent through the pipeline to perform functions such as cleaning the pipeline or inspecting its condition.

The Inuvik Area Facility would be located about 20 kilometres east of Inuvik.

At the Inuvik Area Facility, the raw natural gas would be separated into marketable natural gas and natural gas liquids. Marketable natural gas is mainly methane, with some ethane and propane. It would be temperature-controlled and compressed before being injected into the Mackenzie Valley Pipeline. Natural gas liquids, also known as condensate, are mainly pentane and heavier hydrocarbons. They are refined to make products such as gasoline and petrochemicals. They would be temperature-controlled and then pumped into the natural gas liquids pipeline that goes to Norman Wells.

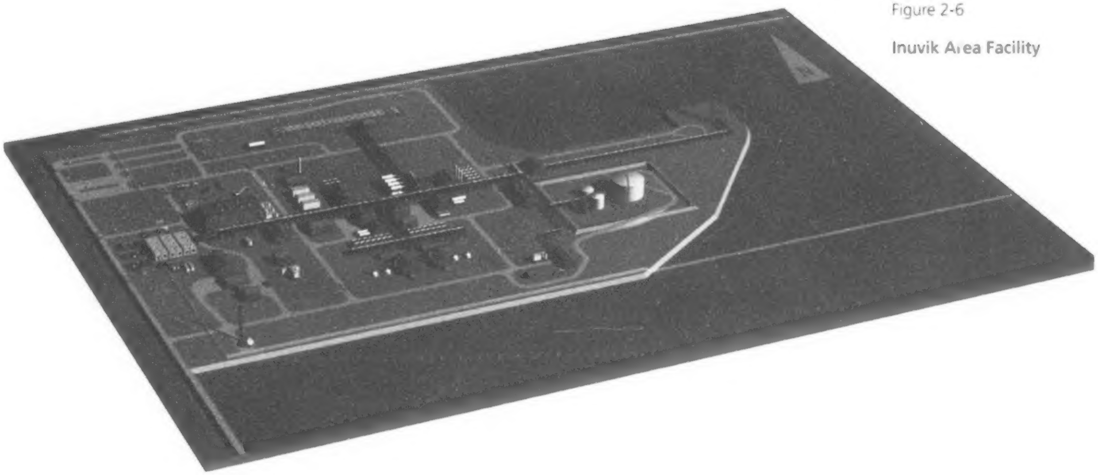
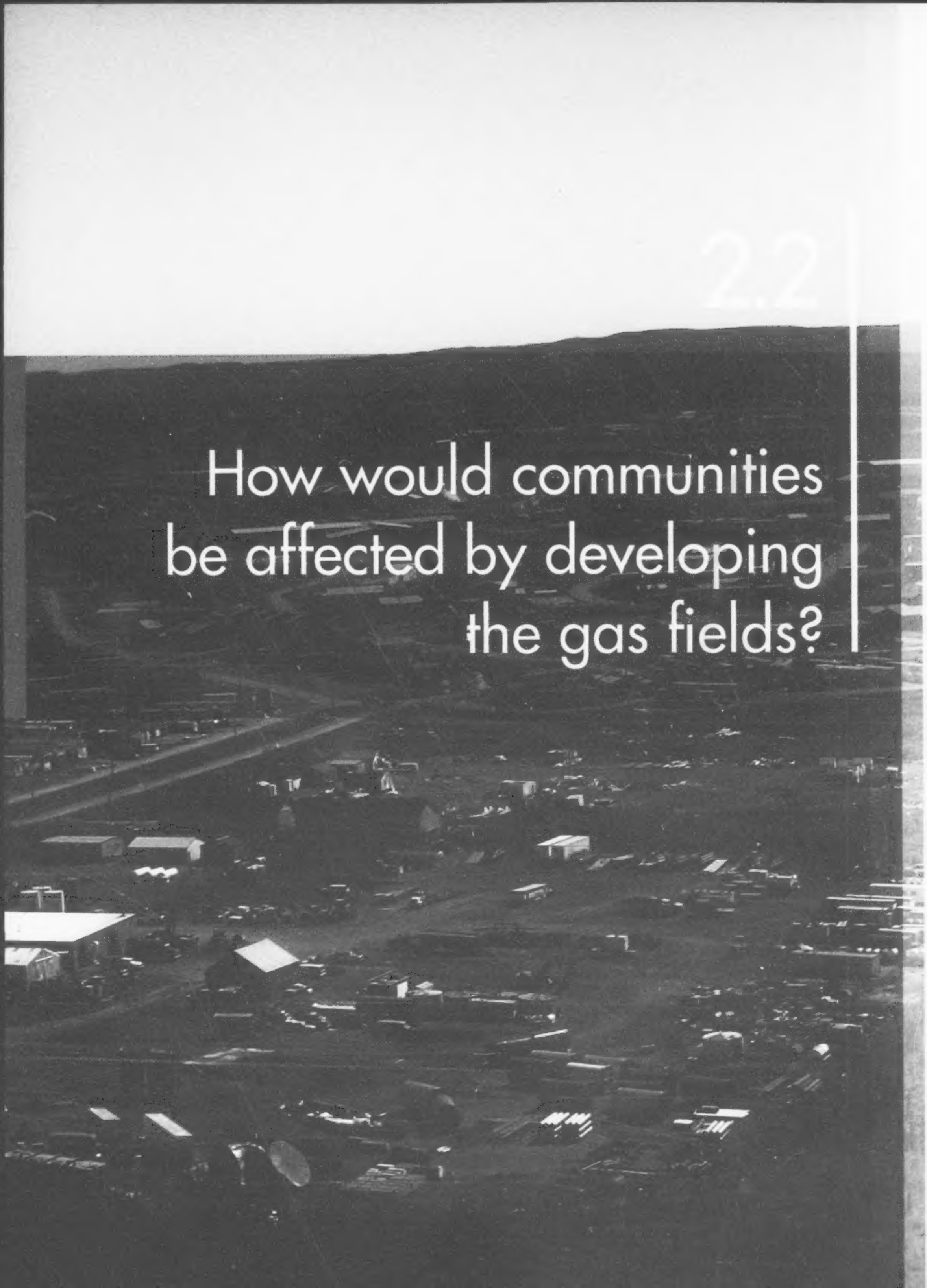


Figure 2-6

Inuvik Area Facility



2.2

How would communities be affected by developing the gas fields?

The project would increase economic activity in the Mackenzie Delta communities, especially during the construction period. At the same time, unwanted effects such as increased traffic and demands on social services would occur.

Communities would experience different effects depending how close they are to the gas fields, the transportation corridor and related facilities. There could be positive impacts such as employment and business activity. There could be negative impacts from demand on medical, police and social services, and the effects of road, air and barge traffic.

The largest community in the Mackenzie Delta region is the town of Inuvik (2009 population 3,586). Other communities in the region include Tuktoyaktuk (2009 population 929), Fort McPherson (2009 population 791), Aklavik (2009 population 645) and Tsiigehtchic (2009 population 136).

One effect on Inuvik from the project would be increased economic activity during the construction period. This could create training, employment and contracting opportunities. There could also be negative effects such as increased traffic in town and on the haul road to the Inuvik Area Facility. After completion, there could be continuing effects from future development. Operating the project would create relatively few permanent jobs. There would be opportunities in maintenance, monitoring and providing goods and services.

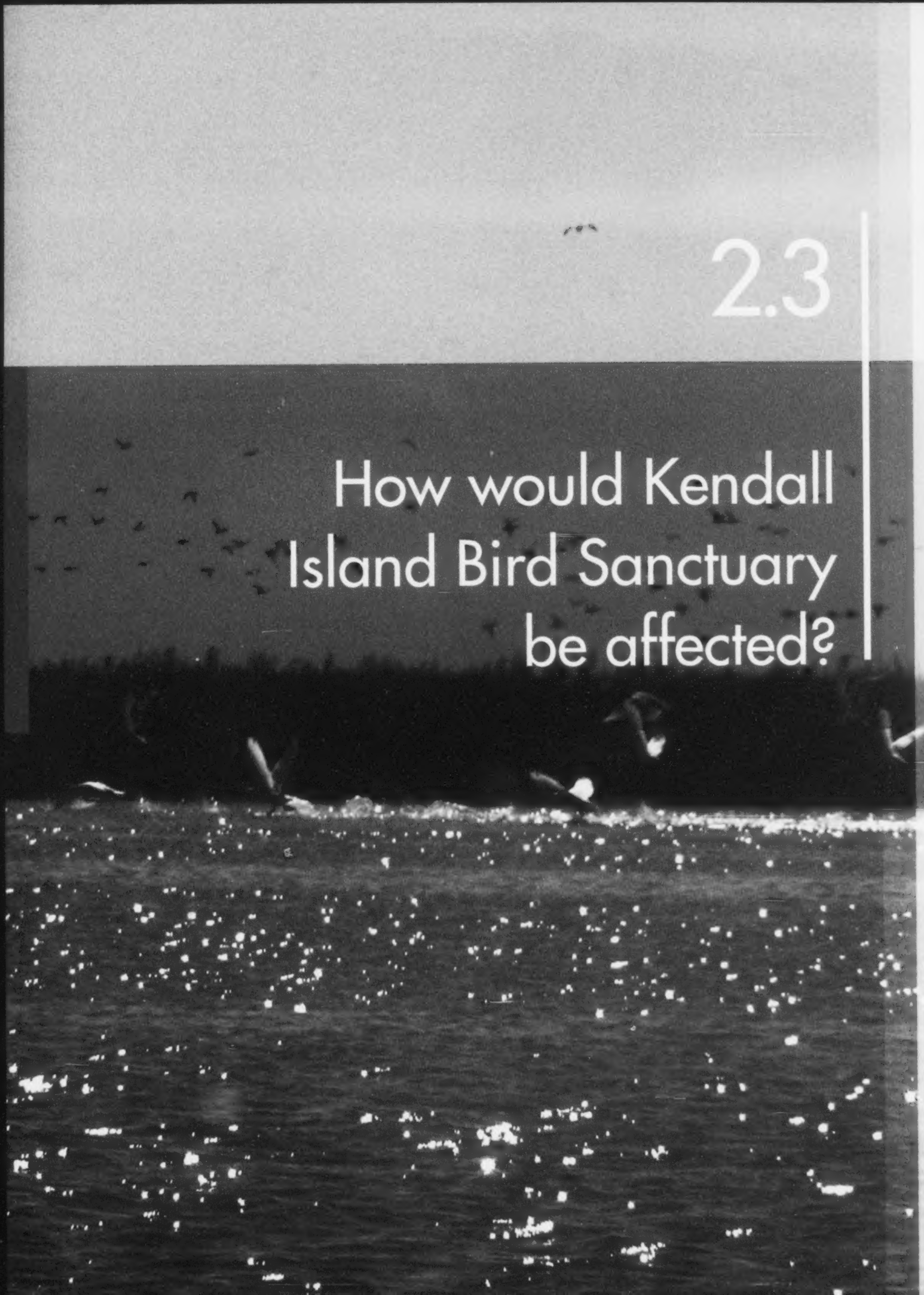
Since the facilities would be 20 kilometres or more from Inuvik, there would be little or no impact from noise and emissions. All emissions would be subject to monitoring and regulation. The companies have submitted plans for safe disposal of solid and liquid wastes such as drilling fluids and cuttings (debris from the drill bit cutting through rock). The National Energy Board and other regulators would make sure the companies follow these plans.

Roger Gruben
Tuktoyaktuk

December 4, 2006

Tuktoyaktuk is still a very traditional community and still very dependent on the environment and the wildlife resources for our lifestyle. We believe that there could be negative impacts from air traffic around the Parsons Lake area on the animals. This in turn will provide negative impacts on the people of this area, on harvesting.

We encourage industry to consult with members of Tuktoyaktuk on addressing and identifying the proper preventative measures for any activity around Parsons Lake and on the wildlife in the area.



2.3

How would Kendall Island Bird Sanctuary be affected?

The Kendall Island Bird Sanctuary is a federally protected area. It is a staging and breeding ground for birds. The Niglintgak and Taglu fields are located within it. The companies would have to comply with Environment Canada's regulations in the sanctuary.

The Niglintgak and Taglu fields are located in the 623-square-kilometre Kendall Island Bird Sanctuary. This federally protected area of low-lying islands serves as a staging and breeding ground for more than 90 species of songbirds, waterfowl and shorebirds. The species include the lesser snow geese, the tundra swan and other migratory birds. Environment Canada regulates surface development in the sanctuary. No more than one percent (six square kilometres) is allowed to be disturbed by oil and gas activity. Development of the two fields would comply with Environment Canada's land use limits.

Timing of construction and other activities in the sanctuary would be important to avoid effects on birds and habitat. Birds are generally present from May to October. At Niglintgak, the proposed construction and drilling programs would occur during winter months. The initial Taglu drilling program would occur uninterrupted for about 16 months, with well completions to follow. Imperial said its development plan is flexible enough to accommodate contingencies that could arise during detailed design, construction and operation of the Taglu field. Before construction and operation, the National Energy Board and other authorities would have to approve wildlife protection and management plans for all three development fields.

Environment Canada and the National Energy Board would both regulate noise levels in the Kendall Island Bird Sanctuary.

Most of the facilities for Niglintgak and Taglu would be built off-site in modules. They would be moved to the field by barge or on winter roads.

Terri-Lee Kuptana
Tuktoyaktuk

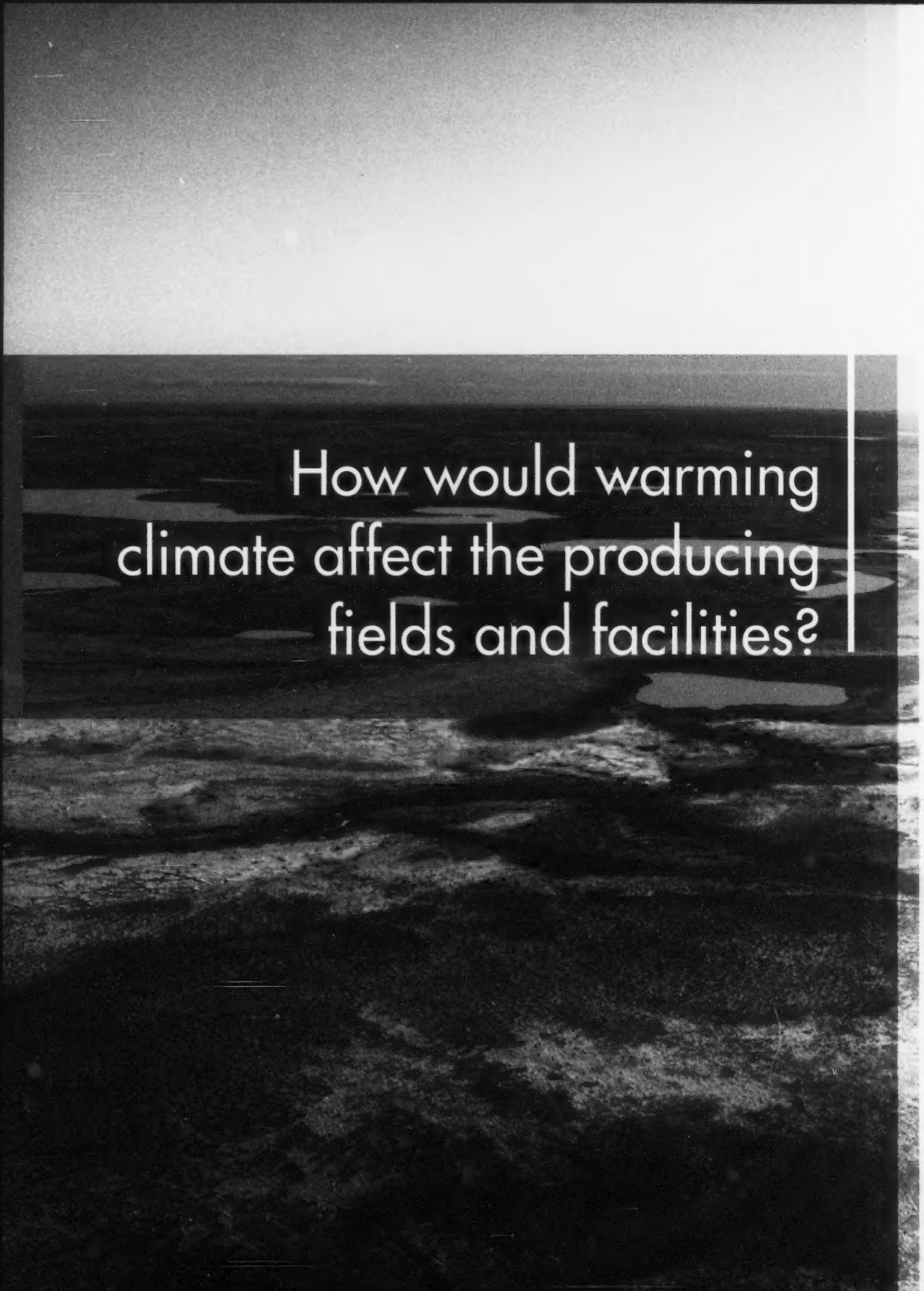
December 4, 2006

Springtime, fall, winter, and summer, we get a lot of our harvesting. In the springtime, it's the geese, and should the pipeline go through, my worry is that the migration will change and, therefore, we'll have to go further.

My father's camp is north of Tuk, and I know the way there and my children are learning the way there. Should the pipeline go through, should anything—operations, whatever, then we have to find a new way, and that just concerns me because that's been passed down from my parents to me and my family members. And also my nephews that are 11, 13, they know this land.

And also, summertime, beluga whale harvest is really important throughout this region. Again, that's a worry for me. I'm asking the Panel, once you make your decisions, to think of not just the present Inuvialuit generation, but future generations to come that it be closely monitored.

How would warming climate affect the producing fields and facilities?



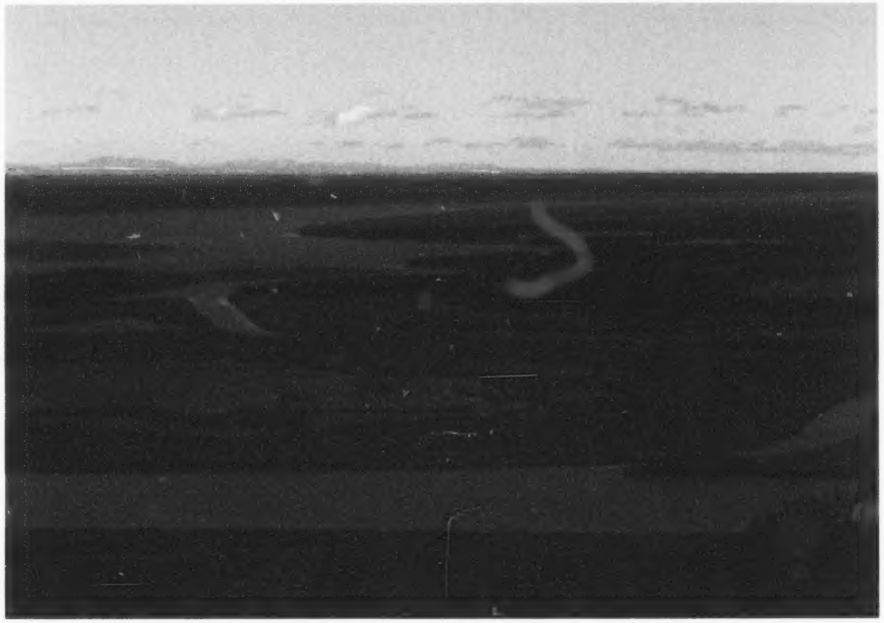
Climate change could cause sea levels to rise during the life of the project. If this happens, facilities would be located high enough above sea level to protect them from storm surges and flooding.

Warming of the global and regional climate could raise sea levels and affect weather patterns. The Niglintgak and Taglu fields are located in the low-lying Mackenzie Delta near the Beaufort Sea. We heard concerns that seasonal flooding and storm surges could affect these facilities during the life of the project. The Taglu airstrip could also be subject to flooding, but in that event workers and equipment would be brought to the site by helicopter. The companies provided evidence that the facilities would be high enough to protect them from storm surges and flooding even if sea levels rise.

Lois Little
Yellowknife

August 1, 2006

We know from experience of others elsewhere in the northern world that climate change is already having a destabilizing effect on fragile Arctic and sub-Arctic ecosystems. Add the MGP to this equation, then the wave of hydrocarbon and other industrial development that will follow in its wake, and we can only expect to incur significant upheaval, stresses and uncertainty both in the natural and human environments.



The Niglintgak and Taglu fields would produce natural gas from relatively shallow underground formations. As the natural gas is removed, the ground could settle by up to almost half a metre due to the removal of natural gas. This possibility was taken into account in the design of the facilities (see Figure 2-7).

Parsons Lake is located on higher ground and further from the sea, so its facilities would be less exposed to possible effects of climate change.

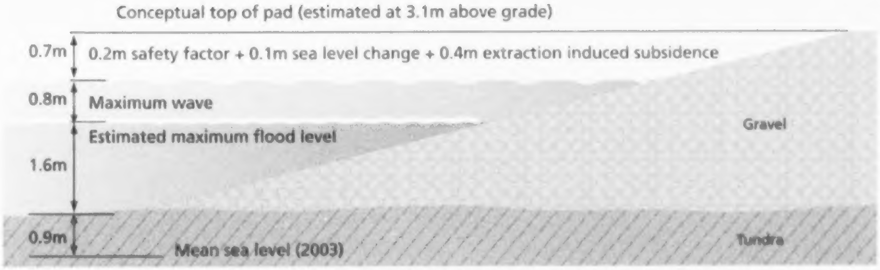
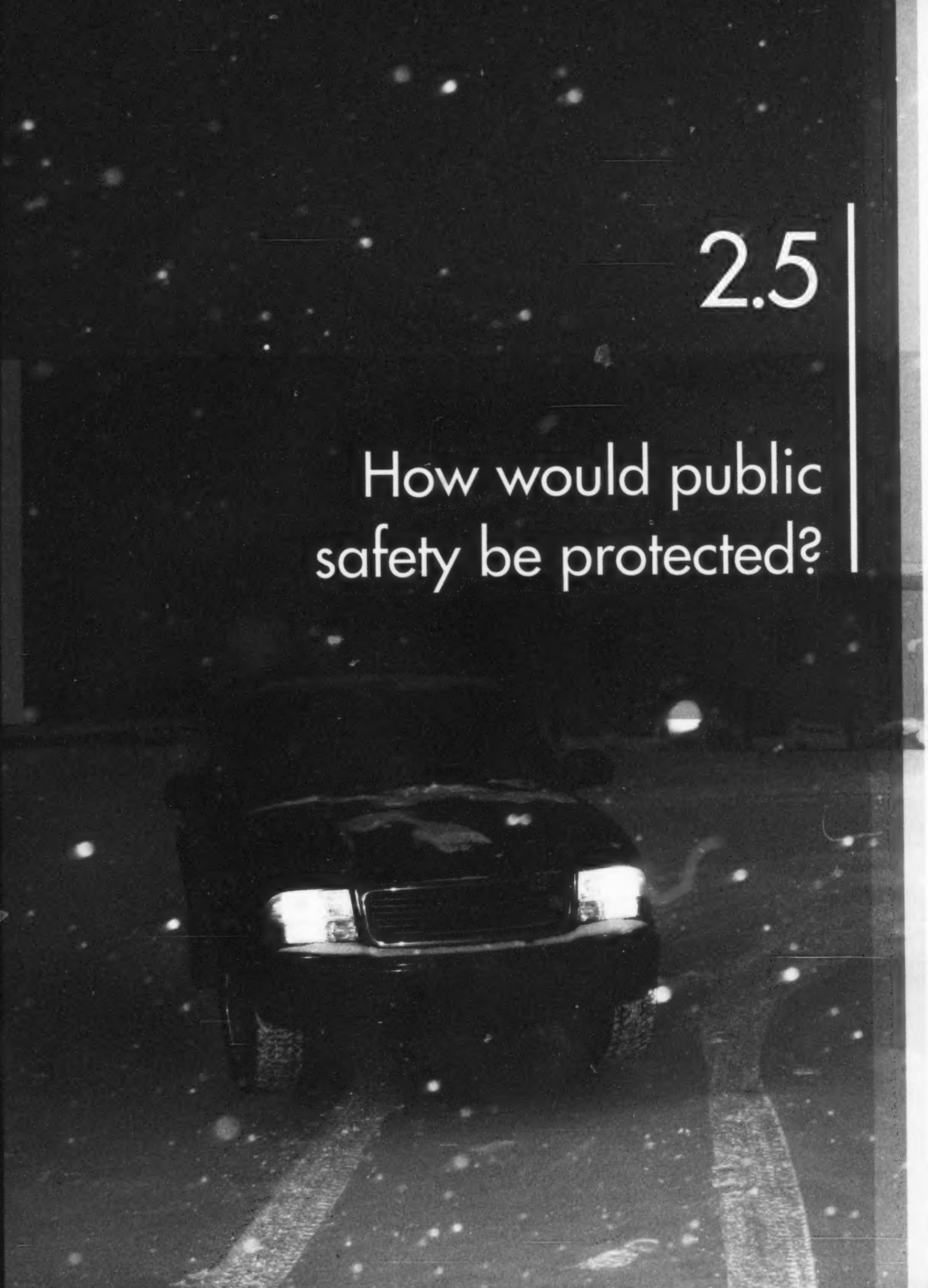

Conceptual top of pad (estimated at 3.1m above grade)
0.7m
0.2m safety factor + 0.1m sea level change + 0.4m extraction induced subsidence
0.8m
Maximum wave
Estimated maximum flood level
Gravel
1.6m
0.9m
Mean sea level (2003)
Tundra

Figure 2-7

Taglu conceptual pad elevation



2.5

How would public safety be protected?

Pipelines and facilities would be located away from where people live. They would be regulated throughout their lifespan to ensure safety and reliability. Gathering pipelines would be buried 60 to 90 centimetres underground. Three layers of coating would protect the steel pipe from corrosion.

The National Energy Board inspects, audits and monitors pipelines and facilities throughout their lifespan, from construction to abandonment. The goal is to ensure safe, reliable operation and to prevent uncontrolled releases of liquids or gases that could endanger workers or the public. Numerous standards and procedures have been established. These are based on a half century of experience with high-pressure natural gas and liquids pipelines. Pipeline failure rates are very low.

The high-pressure pipelines and facilities for the project would be located away from communities. The natural gas discovered in the Mackenzie Delta region does not contain poisonous hydrogen sulphide. This reduces the potential risks to workers and surrounding populations from any accidental gas releases. Because natural gas is lighter than air, it disperses rapidly into the atmosphere. However, sparks or static electricity can ignite released gas.

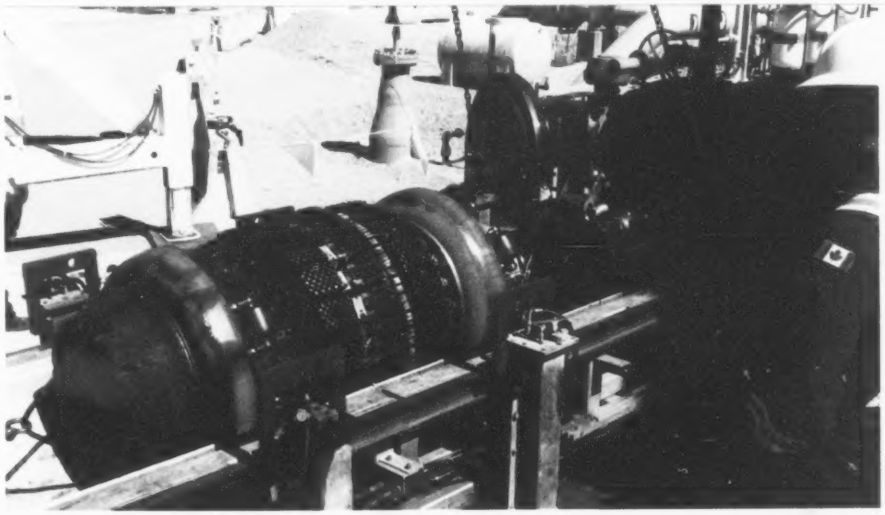
The gathering pipelines would be buried 60 to 90 centimetres underground. Three layers of coating would help protect the steel pipe from corrosion. Pressure-monitoring instruments could detect any large releases of natural gas. Remote-control valves would stop the flow of gas to the affected area in the event of a release. Aircraft would fly the pipeline route regularly to look for disturbance or thawing that might indicate potential problems. Computerized inspection tools, known as smart pigs, would be sent through the pipelines periodically to detect corrosion, dents, bending or buckling.

Building and operating pipelines and facilities on the permafrost of the Mackenzie Delta region poses challenges. Facilities would be supported by pilings or gravel pads so they would not melt the permafrost and sink. Disturbing the surface vegetation could result in permanent scars on the landscape and cause continued thawing of permafrost. Therefore, much of the surface transportation off the right of way would be on winter roads. If the permafrost thaws, the ground can settle. If ice forms in previously unfrozen ground, frost heave can lift the pipe. Both thaw settlement and frost heave can damage the pipeline. The operating companies would monitor and inspect the pipelines and make repairs or replacements as needed.

Terese Remy-Sawyer
Tsiigehtchic

December 6, 2006

We are in the permafrost. So looking at that, would you promise that—no, I shouldn't say promise. Would you make sure that the people that are going to make this pipeline or build this pipeline, that they do it safely? From all your research, you should know what safety is, the measure of how safe the pipeline would be.

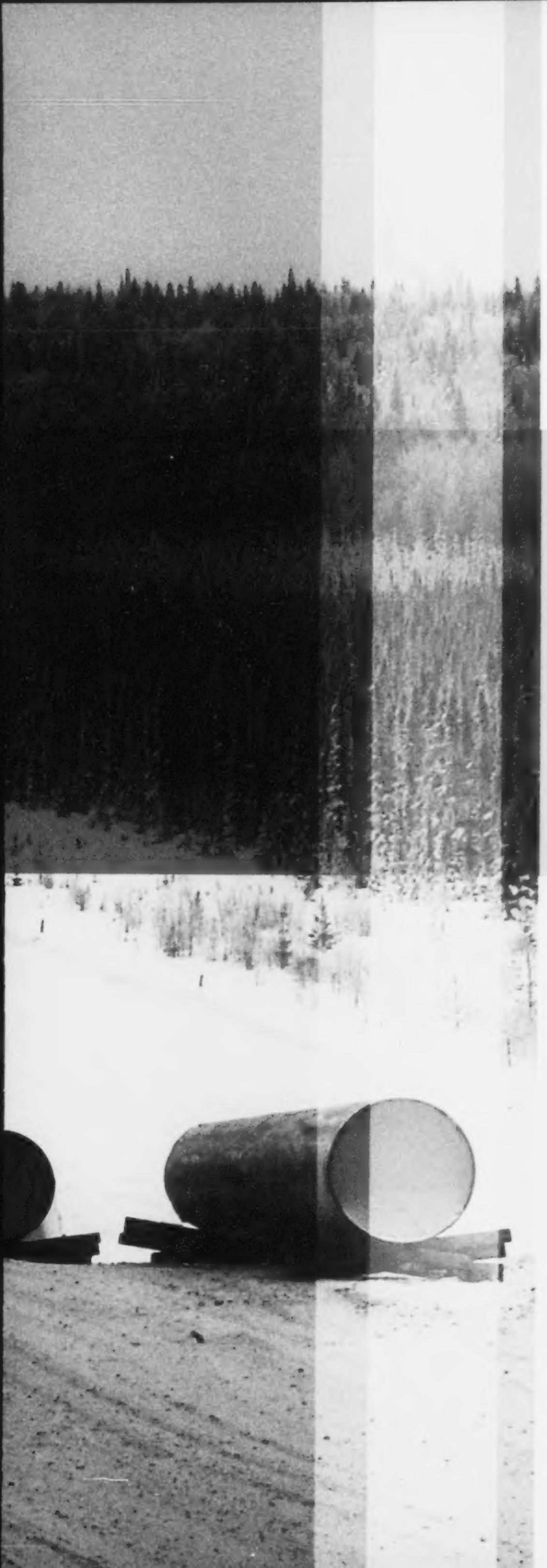


In-line inspection tools

Special tools known as in-line inspection tools or smart pigs are sent through pipelines to inspect the pipe for damage or corrosion that could lead to leaks. Pictured is a VECTRA MFL (magnetic flux leakage) tool exiting a receiver trap.

Part 3

The transmission pipelines



3.1

What are the transmission pipelines?

A buried 250 millimetre (10 inch) diameter pipeline would carry natural gas liquids from the Inuvik Area Facility to Norman Wells where it would connect with an existing crude oil pipeline. The right of way would be 50 metres wide for these 457 kilometres. A buried 750 millimetre (30 inch) diameter pipeline would carry natural gas. It would be built beside the liquids pipeline to Norman Wells, then would continue to Northern Alberta in its own right of way. The right of way would be 40 metres wide for these last 739 kilometres.

The Mackenzie Valley Pipeline would carry natural gas from the Inuvik Area Facility to a pipeline system in northern Alberta. The Mackenzie Valley Pipeline would have several distinct features compared to most natural gas pipelines in southern Canada:

- The temperature of the natural gas going into the pipeline must be controlled to reduce impacts on ground temperatures. This helps to avoid potential damage to the pipeline and the environment. The proposed pipeline route passes through areas with varying amounts of permafrost (see map, Figure 3-1). Ground surface temperature changes with the seasons and along the route. Gas temperature changes as it is compressed and flows down the pipeline. The operating temperature would vary to account for these conditions.
- The natural gas pipeline would operate at pressures of up to 18.7 megapascals (2710 pounds per square inch) and would have thicker walls than most pipelines. This design makes it possible to use a smaller diameter pipe than would otherwise be the case. Because of the thicker walls, the pipe would be better able to withstand forces due to ground movement caused by frost heave and thaw settlement.
- The pipeline and right of way would be monitored more closely than most pipelines.

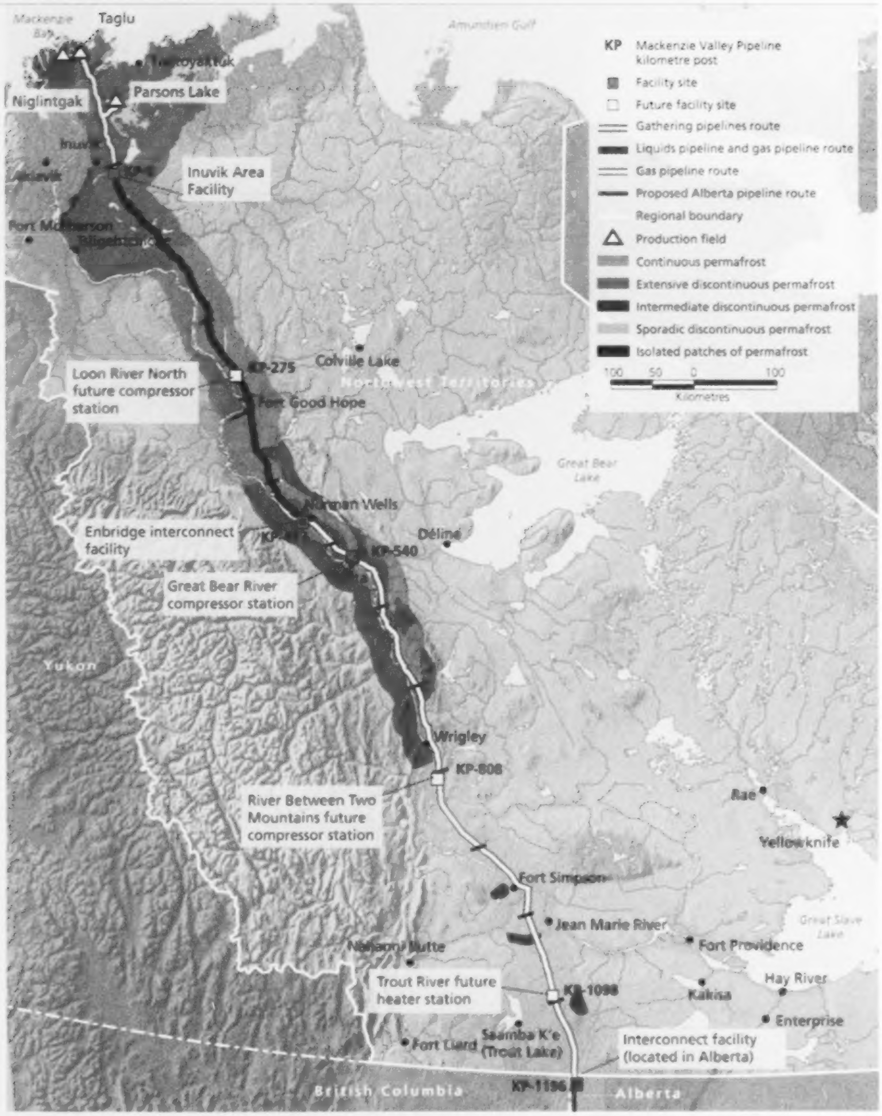
The liquids pipeline would carry natural gas liquids from the Inuvik Area Facility to Norman Wells. The liquids would be a mixture of propane, butane and other hydrocarbons similar to those in gasoline; the most common component would be heptane (22 percent of the mixture). The liquids would be shipped south in the existing Norman Wells Pipeline, which has sufficient spare capacity. To avoid thawing the permafrost, the natural gas liquids would be chilled at the Inuvik Area Facility and would flow through the pipeline at a temperature similar to the temperature of the ground along the right of way.

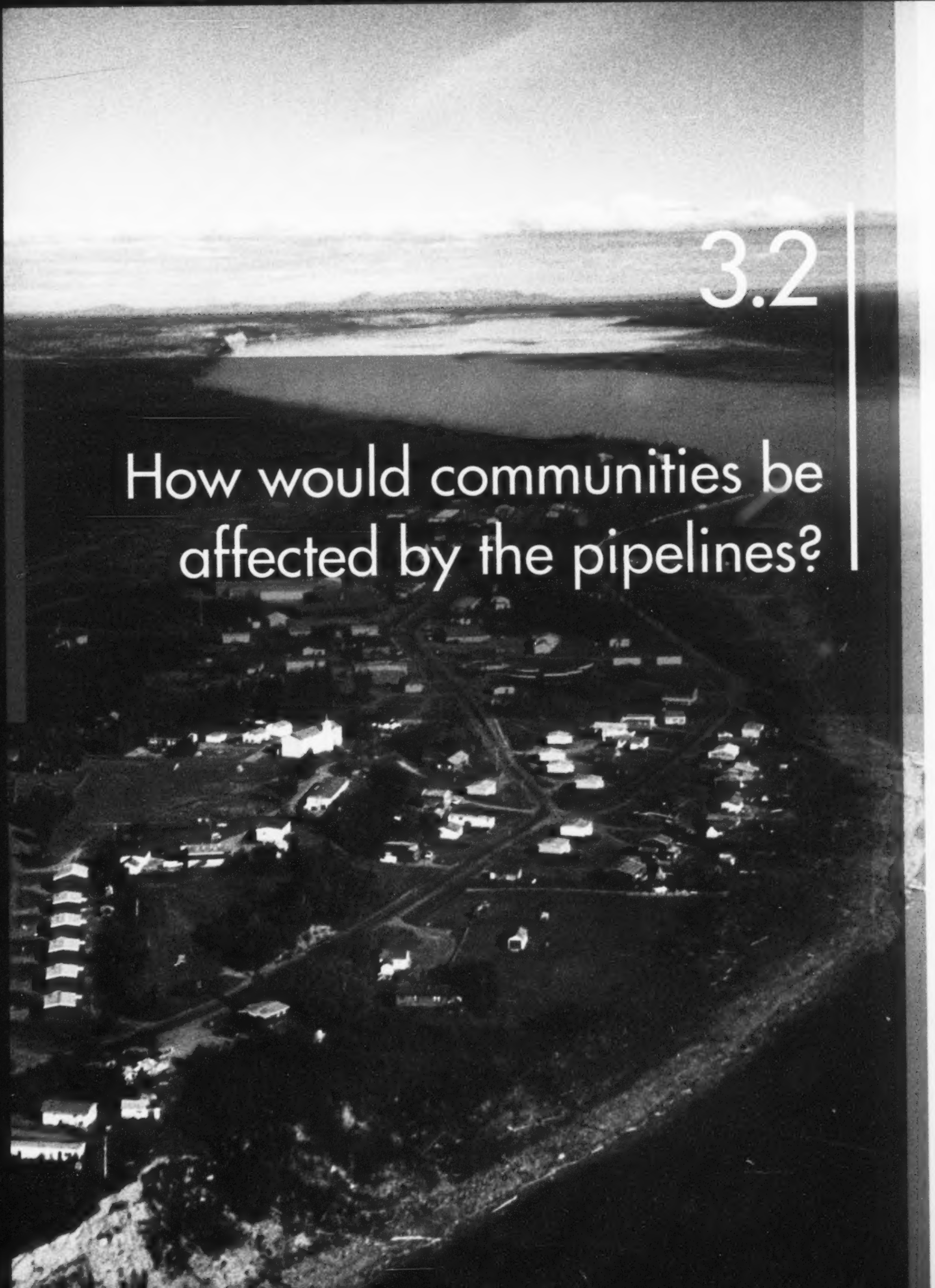
Figure 3-1

Mackenzie Valley pipeline corridor

The companies proposed a one kilometre wide corridor in which the right of way would be located. The exact location within that corridor would be determined after detailed engineering studies if the project proceeds. The detailed route would be subject to approval by the National Energy Board. If anyone objected to the detailed route, there could be a public hearing.

The Mackenzie Valley Pipeline and the natural gas liquids pipeline would be located in a 50 metre wide right of way to Norman Wells. South of Norman Wells, the Mackenzie Valley Pipeline right of way would be 40 metres wide. It would generally follow the route of the existing crude oil pipeline.


Mackenzie Bay
Taglu
Tuktoyaktuk
Amundsen Gulf
Niglintgak
Parsons Lake
Inuvik
Aklavik
KP-0
Inuvik Area Facility
Fort McPherson
Tsiigehtchic
KP Mackenzie Valley Pipeline kilometre post
Facility site
Future facility site
Gathering pipelines route
Liquids pipeline and gas pipeline route
Gas pipeline route
Proposed Alberta pipeline route
Regional boundary
Production field
Continuous permafrost
Extensive discontinuous permafrost
Intermediate discontinuous permafrost
Sporadic discontinuous permafrost
Isolated patches of permafrost
100 50 0 100
Kilometres
Colville Lake
Loon River North future compressor station
KP-275
Northwest Territories
Fort Good Hope
Great Bear Lake
Norman Wells
Enbridge interconnect facility
Déline
KP-540
Great Bear River compressor station
Yukon
Wrigley
KP-808
River Between Two Mountains future compressor station
Rae
Yellowknife
Fort Simpson
Jean Marie River
Great Slave Lake
Nahanni Butte
Fort Providence
Trout River future heater station
KP-1098
Kakisa
Hay River
Enterprise
Sambaa K'e (Trout Lake)
Fort Liard
Interconnect facility (located in Alberta)
British Columbia
KP-1196
Alberta



3.2

How would communities be affected by the pipelines?

Many people were concerned about a pipeline passing through this huge and largely untouched area. Aboriginal people have lived here for thousands of years. They expressed concern about possible impacts on wildlife and on sacred places. There could be employment opportunities. Some communities could gain access to natural gas to use for heat and to generate electricity.

The largest effects on communities would occur during construction. Camps for workers would be located along the right of way and would be "closed." That is, there would be no unplanned contacts between the camps and the communities.

In addition, construction would require barge landings, storage sites, and roads to deliver pipe, equipment and supplies to the right of way. Heavy equipment would clear the ground, dig the trenches, lay the pipe, weld it, test it and cover it. Nearly all of the work would have to occur in winter, avoiding unnecessary disturbance of vegetation and soils. Most of the roads would be winter roads made of snow and ice.

The effects on communities would vary depending on the amount of traffic in the area, how close people are to the right of way, the amount of economic activity occurring, and whether the activity affects hunting, trapping, fishing, cultural sites or traditional land use. There were concerns the project could worsen problems such as alcohol and drug abuse and gambling, and that it could put strains on police, medical and social services, housing supply and affordability, and municipal infrastructure. There could also be employment and business opportunities created by construction and operation of the pipelines.

Communities that currently depend on heating oil and diesel generators would have the opportunity to establish natural gas distribution systems and electric power generation systems. Natural gas would be less polluting than diesel.

During our hearing, we heard many views about a pipeline passing through this huge and largely untouched area where Aboriginal people have lived for thousands of years. Some said they had seen no benefit from the last major industrial activity in the region (the Norman Wells Pipeline) and they wanted a better arrangement this time. The lack of a land claim settlement with the Dehcho First Nations was an issue that many Dehcho said should be resolved. However, other people in the region were enthusiastic about the creation of the Aboriginal Pipeline Group,

Samuel Elleze
Fort Providence

September 25, 2006

As we stay here, we do harvesting. We harvest our animals, and we also do our trapping all year round. When you talk about the pipeline like this, it's going to be right beside us. We know that, and we will feel the impact of it.

Herb Norwegian
Dehcho Elder
Yellowknife

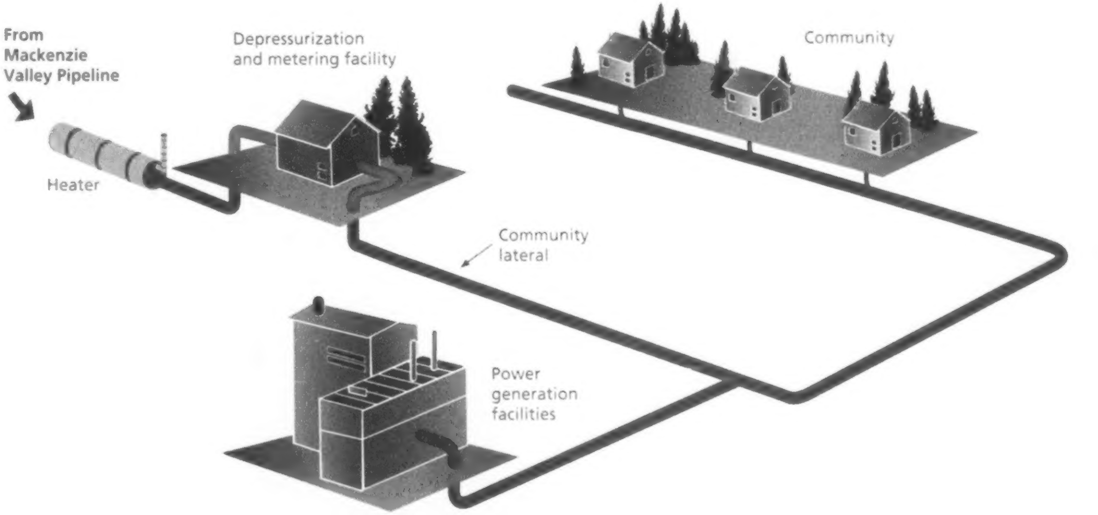
April 15, 2010

Unlike other regions in the Northwest Territories affected by this project, the Dehcho Dene have not resolved our outstanding land and self-government relationships with Canada. Our rights with the pipeline access in the Dehcho Territory should be delayed until the Dehcho Process has been concluded.

The conclusion of the Dehcho Process with a final agreement would provide the Dehcho Dene with a clear and necessary authority to ensure that this project could only proceed in a manner acceptable to us and with our full involvement in all aspects of the project.

Figure 3-2

Community gas pipeline



From Mackenzie Valley Pipeline
Depressurization and metering facility
Community
Heater
Community lateral
Power generation facilities

①

②

③

④

⑤

⑥

⑦

⑧

Typical pipeline construction activities

① **Clearing and grading** The right of way is cleared of trees and brush and levelled for construction.

② **Stringing** Lengths of pipe are moved from stockpile sites on trucks with special trailers and lined up along the right of way.

③ **Bending** Some pipe needs to be bent to the shape of the land so that it will lie flat on the bottom of the trench.

④ **Welding and coating** Lengths of pipe are joined together using mainly automatic welding machines. Every weld is inspected using ultrasound or x-rays so that defects can be detected and removed. The pipe is pre-coated in a factory, but the welds are coated on the right of way to help prevent future corrosion.

⑤ **Trenching** A trench is dug deep enough to bury the pipe 60 to 90 cm below the surface. The pipe is installed deeper at water and road crossings.

⑥ **Lowering** Machines with special arms called sidebooms are used to lower the joined pipe into the trench. The pipe coating is checked just before the pipe is put in the ground.

⑦ **Backfilling** The trench is filled back in, taking special care not to damage the pipe coating.

⑧ **Reclamation** The land is reclaimed, contoured and re-vegetated as necessary.

the chance to share financial benefits, and the opportunities that might be created for young people. Worries about effects on wildlife and on sacred places were common, whether people supported or opposed the pipeline.

The Aboriginal Pipeline Group includes many communities in the project area. It was formed in 2000 while the companies were still studying the possibility of this project. After more than a year of negotiation, the Aboriginal Pipeline Group signed a Memorandum of Understanding with the companies. The agreement included an option for local Aboriginal groups to own up to one-third of the Mackenzie Valley Pipeline.

The ownership share of the Aboriginal Pipeline Group in the Mackenzie Valley Pipeline would depend on the proportion of gas shipped by companies other than owners of the anchor fields. The minimum ownership share is based on a formula and is expected to be in the range of two to three percent. If the pipeline's full capacity with three compressor stations were achieved, then the Aboriginal Pipeline Group could acquire up to 33.3 percent ownership in the Mackenzie Valley Pipeline.

James Andre
Fort McPherson

December 5, 2006

And when you have—you know, like during the big oil boom—that was the late seventies, I believe a lot of our people were working and came back and, you know, the community was just constantly drinking, drinking, drinking.

And now our young people are—you know, like drinking is put aside and a lot of drugs are starting to show up in our community.

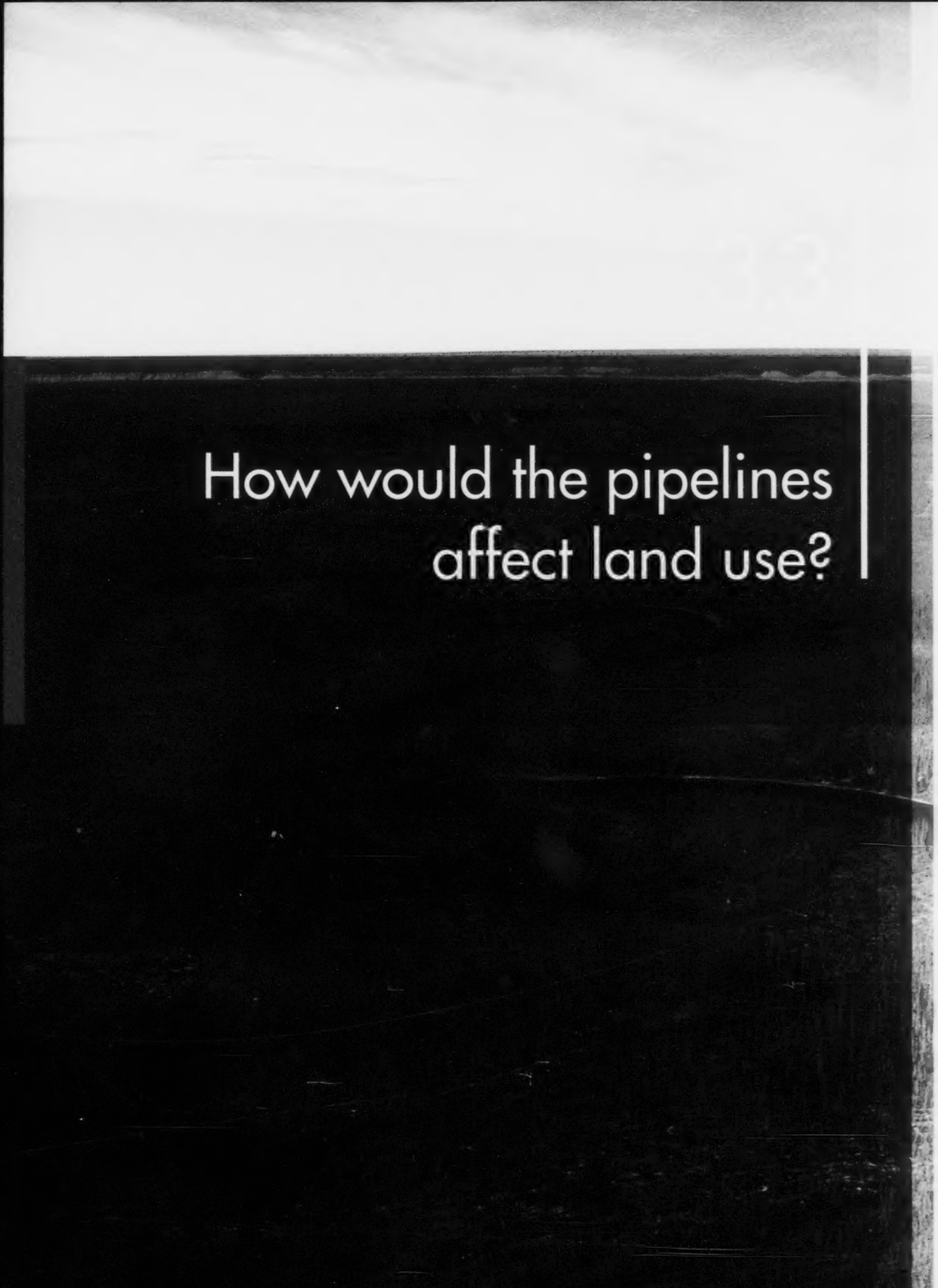
Anywhere where there's money involved, there's crime. All you have to do is look at Yellowknife. They made a big public statement, you know, like how many people are addicted to crack in Yellowknife. That's the same thing that is going to happen with us.

Chief Charlie Furlong
Aklavik Indian Band
Inuvik

January 28, 2006

The Gwich'in desire to become independent from government grants and influence. The Gwich'in desire to be masters of their own destiny. The Gwich'in desire to be self-governing, but we also realize that before we become self-governing, we must first become self-sufficient, and we believe if we are to become self-sufficient, we must take control of our nation, we must develop our resources. We must use those resources and those developments in order for us to benefit and to set up the governing régimes that our people today, tomorrow and in the future will become masters of their own destiny.

The Gwich'in feel that we need projects such as the pipeline, such as the mining industry, future hydro to build a needed capacity. Our people must become managers. No longer should we depend on a non-Aboriginal from down south coming in and telling us what to do.



How would the pipelines affect land use?

The project would have to conform to land use plans established under the *Mackenzie Valley Resource Management Act*.

The pipeline right of way would be either 40 or 50 metres wide depending on location. It would be located within a one kilometre wide corridor identified in the applications. The exact route would depend on detailed engineering and environmental studies. The National Energy Board could hold a hearing if anyone objected to the detailed route plan.

The project must conform to land use plans established under the *Mackenzie Valley Resource Management Act*. Approval from land use planning boards established under the Act is required before any federal agency can issue authorizations for a project.
In addition, the companies must obtain rights for access to the land for the right of way and for roads, barge landings, camp sites, borrow pits and other uses.

Land use planning varies widely among settlement regions in the Mackenzie Valley. The Gwich'in Settlement Area has an approved land use plan. The Gwich'in Land Use Planning Board is in place. The Sahtu Settlement Area has a preliminary draft land use plan.

The Dehcho First Nations have an interim land use plan that includes provision for a pipeline corridor.

Pipeline construction would be carefully planned to minimize impacts to the land. The companies would be required to schedule and locate their activities to minimize noise and disruption to wildlife. Several plans for environmental protection would be developed by the companies for approval by the National Energy Board before construction begins. Wildlife Protection and Management Plans would describe how workers would avoid areas used for bear dens, caribou movement, and sensitive times for caribou feeding and calving. Environmental Protection Plans would direct workers and contractors to measures that would protect the air, water, vegetation, and wildlife during construction. Waste Management Plans would guide the appropriate disposal of waste from construction sites.

The companies, in cooperation with local residents and northern authorities, would be required to monitor the effects of pipeline construction on the land and wildlife. The National Energy Board would conduct its own inspections, monitoring and audits to make sure the companies comply with their plans.

Shayla Snowshoe
Fort McPherson

December 5, 2006

As a youth of this community, I often feel we need to listen to our Elders. They are wise. They know. Many of them know we need to make our land our priority. Our land and our Elders cannot be replaced.

When our Land Claims were signed, our leaders said they would protect our land for the future. I am the future. One day, I want to be able to take my children out to my Jijuu's fish camp and to where she used to go trapping with her dad, but that might not be possible if you build the pipeline. I am not guaranteed that our land will be safe.

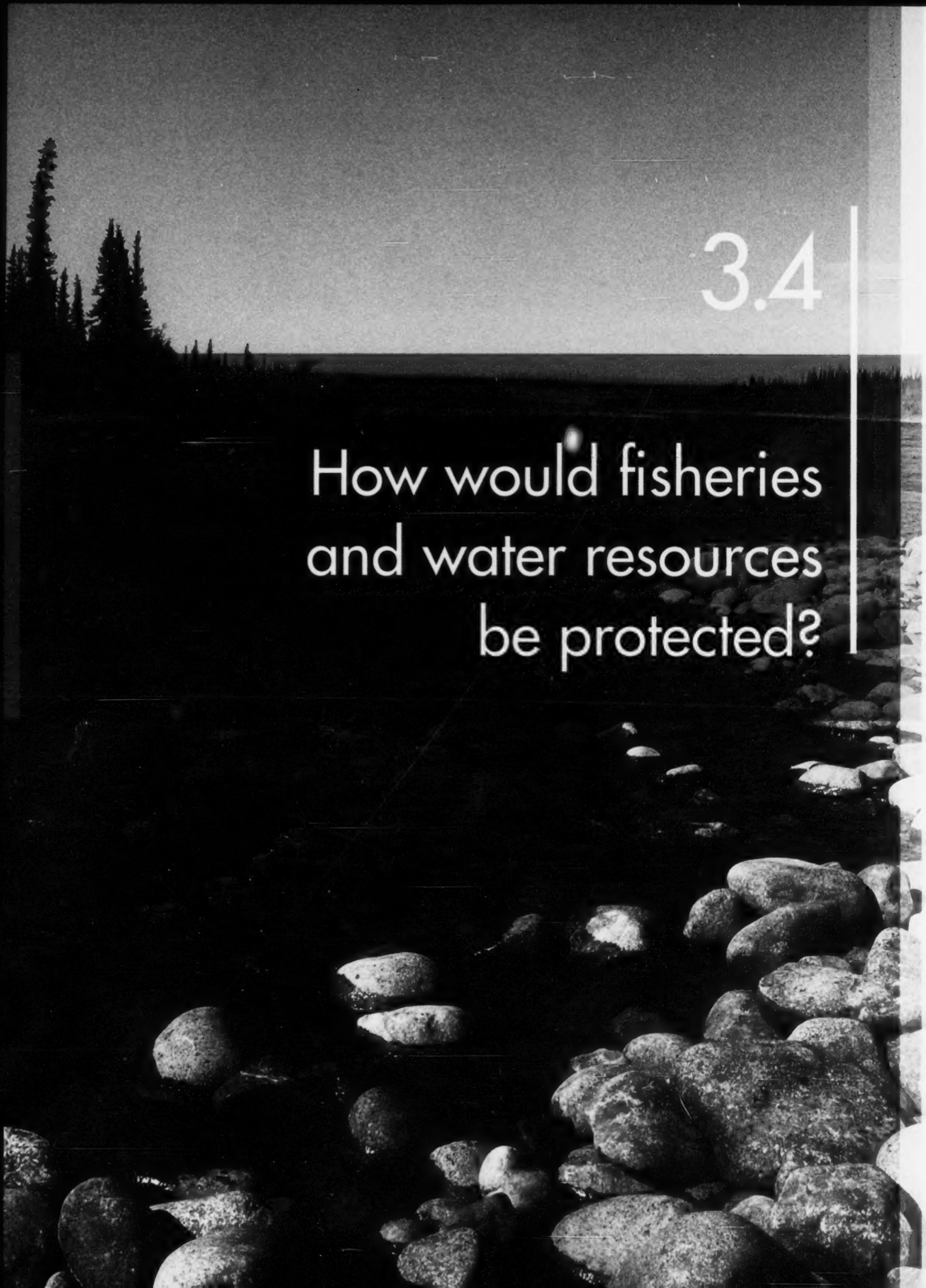
Walter Landry
Fort Providence

September 26, 2006

I wish we could do this in a positive way that no one would get hurt from that oil company taking stuff out of the ground. I was thinking about a fire ceremony, have a fire ceremony, and that way when we go out in the land, we do a ceremony on the fire, and we go out, get berries. We do the same thing to the water, we put tobacco, and when we travel, so nobody gets hurt. So that's how we would take care of Mother Earth and the land through songs. We've got songs for Mother Earth and water, so that the land keeps all our values, that everybody has a value, I think it's inside the land gives.

The land nourishes you, it takes care of you. So through that ceremony, that fire, everything goes on your side, everything works with you. That's how we live on the land and—and protect the land. But that's good. I just wanted to share that with you guys. Mahsi.

The pipeline right of way would pass through habitat of boreal woodland caribou, listed as "threatened" by the Committee on the Status of Endangered Wildlife in Canada.



3.4

How would fisheries and water resources be protected?

The pipelines would cross 643 water bodies and would be buried at least two metres under them. Special measures would be taken to prevent thawing and erosion on slopes leading down to water bodies.

Watercourse crossings

Number of Watercourses	Classification	Crossing Method	Description
576	Trench	Open cut	Trench dug, often in dry or frozen bed
50	Trench	Isolation	Trench dug while water flow is diverted
17	Trenchless	HDD	Horizontal directional drilling under water body

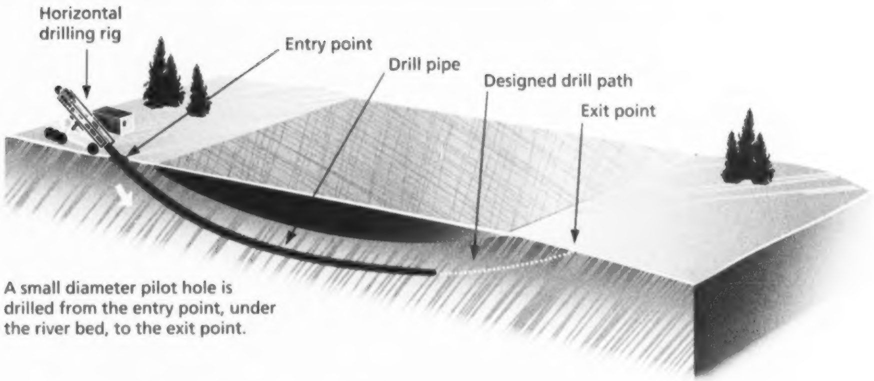
Construction and operation of the pipelines would be planned, monitored and regulated to avoid negative effects on fisheries and water quality. Construction would occur in winter when the majority of northern waterways are frozen.

The gathering system and the pipelines would cross 643 water bodies. These range from seasonal drainages to major rivers. At these crossings, the pipelines would be buried at least two metres below the bed of the stream or lake. This would protect the pipe from threats such as ice jams or shifts in the channel. The main risk to fisheries and water quality would be erosion or other disturbance of the banks.

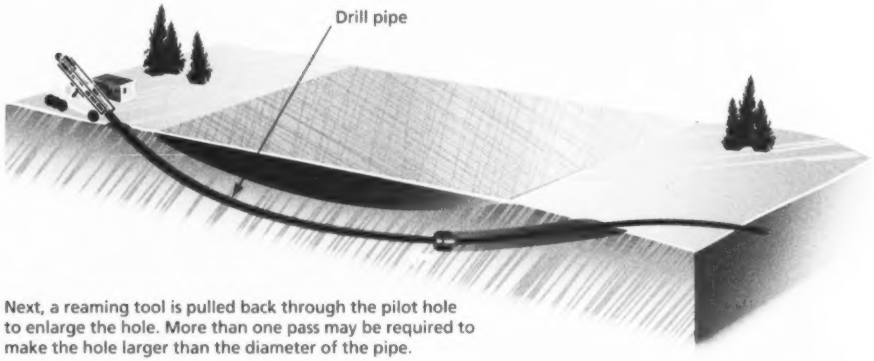
For most crossings, an open trench would be dug while the water was frozen. In other instances, some water would still be flowing in winter. Barriers would block or divert any flowing water around the excavation during trenching and pipe-laying.

Figure 3-3

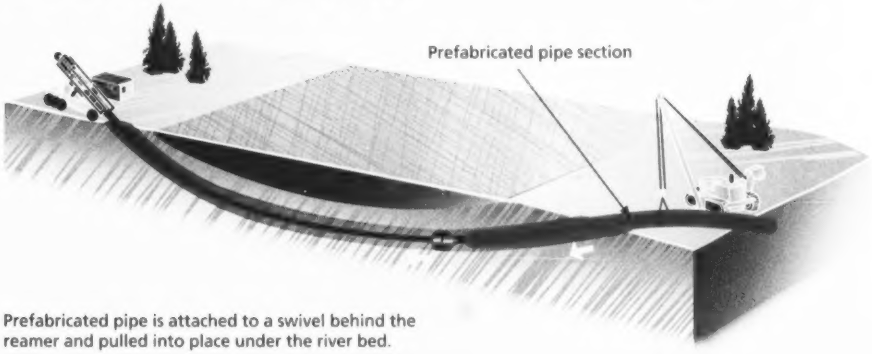
Water crossing by horizontal directional drilling



A small diameter pilot hole is drilled from the entry point, under the river bed, to the exit point.



Next, a reaming tool is pulled back through the pilot hole to enlarge the hole. More than one pass may be required to make the hole larger than the diameter of the pipe.



Prefabricated pipe is attached to a swivel behind the reamer and pulled into place under the river bed.

At 17 locations, the pipeline route would cross large, fish-bearing water bodies. At these sites, horizontal directional drilling would be used. A hole would be bored under the river bed, and pipe would be pulled through to the other side. The open cut method would be used if directional drilling does not work at a site.

It is important to control thawing and prevent erosion on the slopes leading down to water bodies—and on other, similar sloping terrain. Thawing and erosion could affect the stability of the slopes and deposit soil in water bodies. Insulation and thermosiphons would be used to reduce or prevent thawing.

Joe Lacorn
Fort Providence

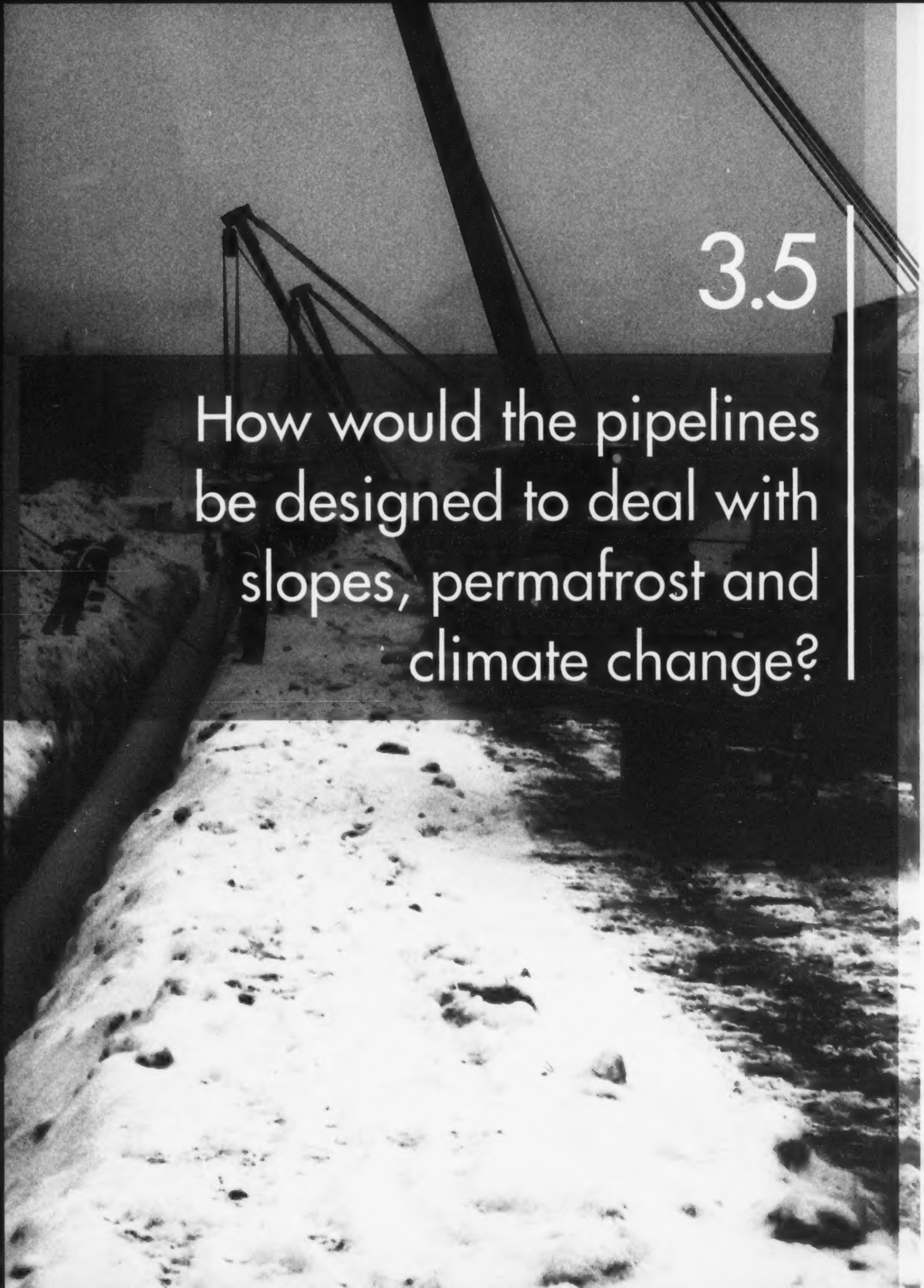
September 26, 2006

It's going to be a big difference on the river where people are fishing and harvesting at this time of the year. And hunting season happens every year, too, so—well, anyway, but the river and the barges, there's a little bit of trouble here and there and nothing happening yet, but if there's a big rush and the barges happen to be moving back and forth upriver, I guess there's going to be a change into the river system with all the barges running back and forth.

Just concerning about the shallow parts, maybe if it could be done a little earlier during the summer where the water is high, transportation will be a lot easier. In the middle of summer where the water drops, it's going to stir up a lot of mud and weeds, whatever, in the bottom of the river.

So I don't know, with a big rush like that, maybe the fish will take an ill effect, and I don't know about harvesting during the time that people are going to be harvesting their fish for winter. So maybe in between there, where people are harvesting and hunting, I think it's got to slow down. The traffic has to slow down.

Barge traffic, landings, roads and storage areas on or near the Mackenzie River would be required to comply with regulations to prevent impacts on water quality and fisheries.



3.5

How would the pipelines be designed to deal with slopes, permafrost and climate change?

The pipelines pass through areas of permafrost. The temperatures of the pipe and the surrounding soil are taken into consideration in the design. The natural gas pipeline would have thicker walls, operate at higher pressures, and be monitored more closely than most other pipelines in Canada.

The Mackenzie Valley Pipeline and the natural gas liquids pipeline have been designed to be strong enough to contain the high pressures of the natural gas and liquids. They are also designed to withstand movement of the ground in which they would be buried.

The entire pipeline route passes through areas with varying amounts of permafrost, ranging from continuous permafrost near Inuvik to discontinuous permafrost near the Alberta end.

The companies proposing the pipelines propose to control the temperature of the natural gas and natural gas liquids at the outlet of the Inuvik Area Facility, at compressor stations and at the Trout Lake heater station. Natural gas would leave the Inuvik Area Facility at an average temperature of -1°C whereas the compressor stations further south would have average discharge temperatures above 0°C. Natural gas gradually cools as it expands when it travels down the pipe. The design of the Mackenzie Valley Pipeline would account for thawing and freezing soil conditions, the temperature of the gas in the pipeline and the temperature of the ground around it. The natural gas liquids pipeline would operate at approximately the same temperature as the ground around it.

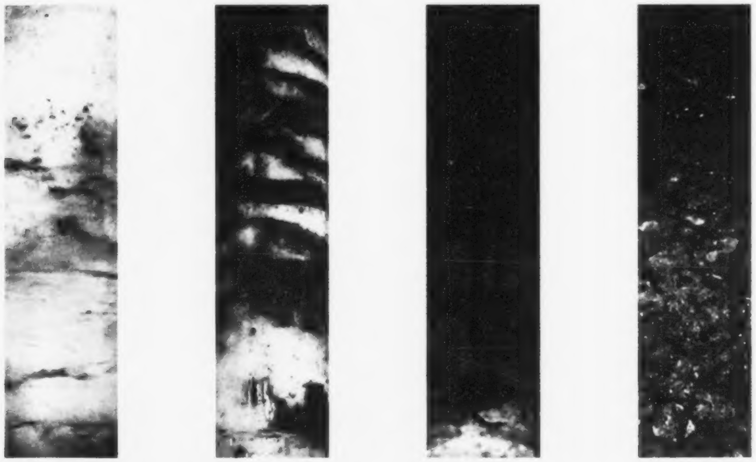
To determine how thick the pipe wall would need to be to contain the natural gas or natural gas liquids, the companies used the same method of design as is commonly used for pipelines elsewhere in Canada, referred to as "stress-based" design. To determine whether the pipeline could safely withstand ground movement, they used another approach known as "strain-based" design. The general approach to the design was to first calculate the wall thickness and grade of steel required to withstand the pressure, and then to verify whether that pipe could withstand the expected movement under a range of conditions along the route.

Johnny Vital
Deline

October 2, 2006

So if you guys really damage the land, I wonder what's going to happen? There's going to be some way it's going to be—some land will be damaged when you're talking about the pipeline.

There's a road ahead of here and there's two rivers, and when we were talking about rivers and stuff like that, and it could be damage, too. And those kind of things, we have to worry about them. And even snow and water, we have to think about this.



Massive ground ice **Ice-rich** **Ice-poor with ice lens** **No visible ice**

Core samples are taken of the soil to provide information for facility design. The samples are used to determine the nature of the soil and, in the case of permafrost, the amount of ice present. As shown in these 100 mm (4 inch) diameter cores, permafrost can vary from massive ground ice to ice-poor permafrost with no visible ice, depending on the location and type of terrain.

Figure 3-4

Frost heave

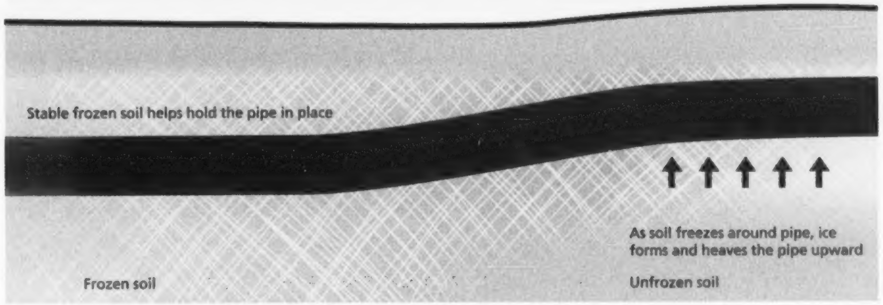
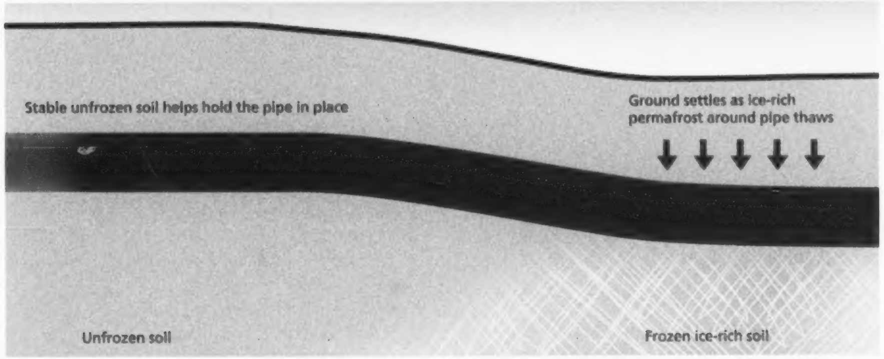

Stable frozen soil helps hold the pipe in place
As soil freezes around pipe, ice forms and heaves the pipe upward
Frozen soil
Unfrozen soil

Figure 3-5

Thaw settlement


Stable unfrozen soil helps hold the pipe in place
Ground settles as ice-rich permafrost around pipe thaws
Unfrozen soil
Frozen ice-rich soil

Melting and freezing of the water in the ground can result in thaw settlement or frost heave and can affect the stability of slopes along the route. Removing the vegetation to build the pipelines would allow the summer heat to penetrate the ground more deeply and lead to thawing of permafrost in the right of way. Climate change could increase the thawing of the permafrost but not as much as the clearing of the vegetation.

For the Mackenzie Valley Pipeline, the designers calculated a single wall thickness that would be used for the majority of the pipeline route. A heavier wall pipe would be used at the larger river crossings, road crossings and fabricated assemblies. In doing their calculations, they used an existing body of information about soil conditions previously collected by others as well as additional information gathered as they moved from conceptual to preliminary design. They said it would not be practical to collect more detailed, site specific soil data at an early stage of design since the precise route of the pipeline had not been fixed. Detailed design and gathering additional site-specific route information would not start unless the project is approved, and would continue until construction begins on each facility or pipeline construction spread.

As a consequence of this design approach, the pipeline companies would need to actively monitor where and how much the pipelines move during operation, and would need to take corrective action to repair, replace or relocate the pipe where necessary. Monitoring would include flying over the pipelines to observe ground disturbance, reading instrumentation installed at selected slopes, and using in-line inspection tools. The tools collect information as they travel through the pipeline.

Rick Luckasavitch
Mackenzie Gas Project
Norman Wells

April 24, 2006

The operating temperature of the pipelines is more driven by some of the pipeline design considerations in the environment in which we're working, so we're trying to strike a balance between thaw settlement and frost heave effects. That's one of the considerations in our pipeline design.

Figure 3-6

Slope instability

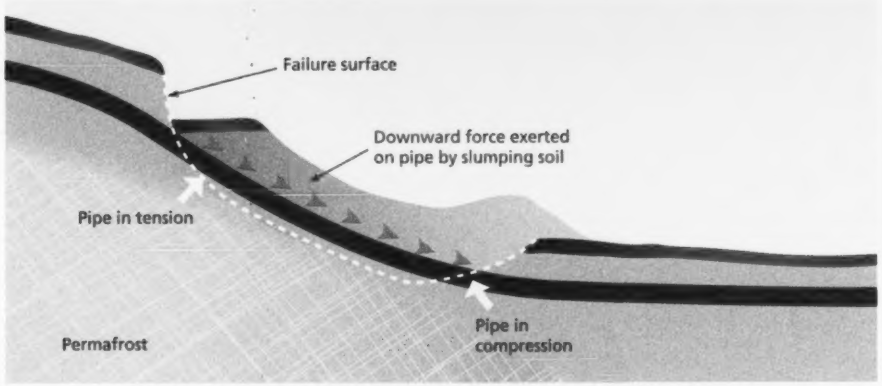
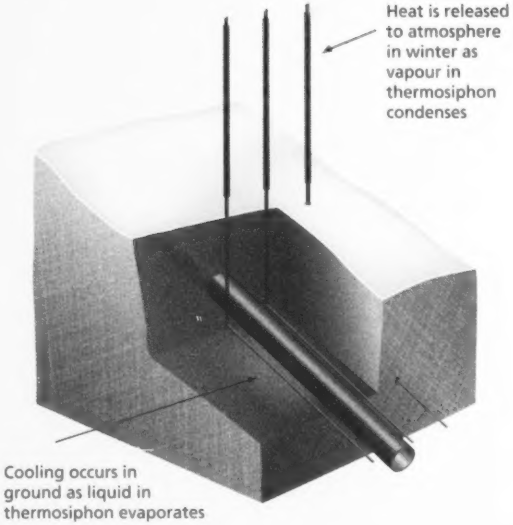

Failure surface
Downward force exerted on pipe by slumping soil
Pipe in tension
Pipe in compression
Permafrost

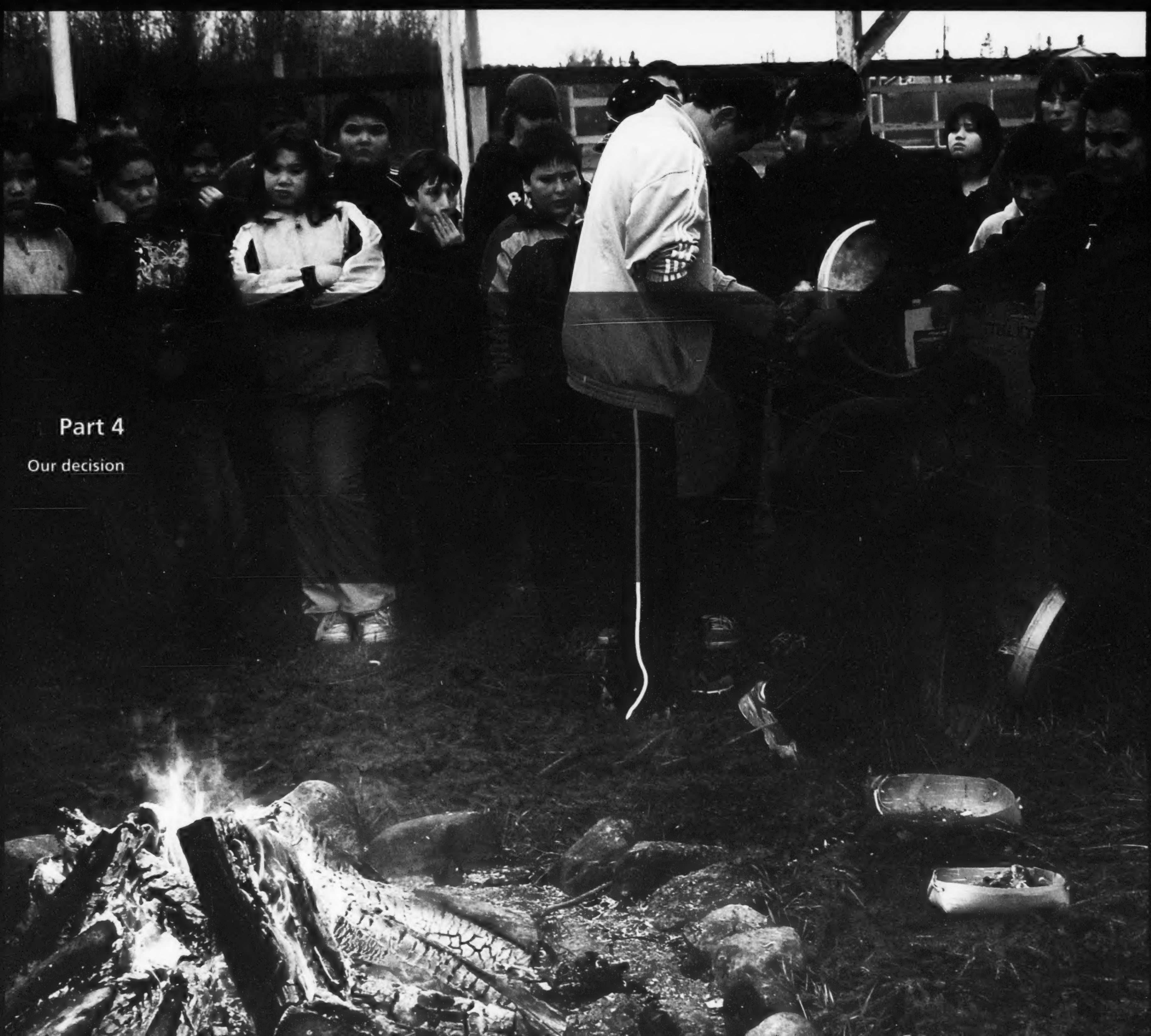
Figure 3-7

Thermosiphon

Thermosiphons, devices which draw heat from the ground, would be used where needed to reduce the rate of thawing and slow ground movement.

Insulation, such as wood chips, could also help protect the slopes or reduce the amount of soil freezing caused by the pipe.


Heat is released to atmosphere in winter as vapour in thermosiphon condenses
Cooling occurs in ground as liquid in thermosiphon evaporates



Part 4

Our decision

4.1

Should the Mackenzie Gas Project be approved?

We have decided that the project is in the public interest. In reaching this decision, we have considered the social, environmental and economic effects and listened to the views of Northerners and other parties. Our approval of the applications for the Mackenzie Gas Project depends on the companies meeting a combined total of more than 200 conditions to address the concerns that we heard. If it is built, the National Energy Board and other authorities will continue to oversee the project throughout its life.

We have reached the destination of our journey through the Mackenzie Valley. Over the past six years, we listened to the voices of Northerners and visited their communities. We considered the evidence of those who supported and those who opposed the project.

We looked at how the project would contribute to sustainability in the way it would affect the people, the land where they live, and the economy, now and in the future. Our conclusion is that the project is in the public interest and should be approved.

Our approval depends on the companies meeting many conditions. The conditions require the companies to undertake a large number of activities and consultations. The National Energy Board will enforce these conditions should the companies decide to go ahead with the project.

We examined the benefits the project could bring. We found that they are large and varied. We also looked at the negative impacts. We found that they can be minimized and are acceptable. This allowed us to answer the key question before us, whether the North and Canada would be better off with the project than without the project. We find that the North and Canada would be better off with the project.

Our thinking required us to bring together many factors into a single decision. In doing so, we considered:

- the people, especially those who would be most directly affected;
- the land, in the broad sense, including the environment and natural resources;
- the economy; and
- safety, including design, construction and engineering plans.

Integrating our findings on these factors is how we reached our public interest decision.

The people

We found that the people of the North in all regions have hopes for better lives and a better future. We believe their aspirations are achievable.

Northerners want to see more people living proud and self-sufficient lives. They want better care for the land. They are looking for stronger communities that can take care of the social problems that come with limited means and rapid change. These economic, environmental and social objectives must be brought together to create the North that many people want. It takes a good economy to take care of the land and the people. We are convinced the Mackenzie Gas Project would bring the Northwest Territories closer to the vision of the North that many people have shared with us.

Some Aboriginal people opposed the project on grounds it could destroy their traditional way of life. Some said they would not get enough benefits from the project to make up for the impacts. Twenty-nine percent of the total length of the pipeline for the project, and 44 percent of the Mackenzie Valley Pipeline, would be in the Dehcho Region. Dehcho leaders and residents urged us not to approve the project until their land claims are settled with

the federal government. The Dehcho said a land claims settlement would be the starting point for talks with the pipeline company on access and benefits.

We note that the Dehcho claims process continues and an interim land use plan is in place for the region. Concerns from Dehcho communities also led to a number of route and design changes that now form part of the commitments the National Energy Board will enforce. A number of our conditions respond to Dehcho concerns such as environmental monitoring and wildlife management.

Leaders of the Inuvialuit and Gwich'in strongly supported the project. Leaders and residents from Colville Lake also said they hoped natural gas discoveries in their area would be developed and connected to the pipeline. Along with the Sahtu, the Inuvialuit and Gwich'in are partners in the Aboriginal Pipeline Group and stand to gain if the project is built. Their share increases if the project expands beyond the volumes already contracted from the anchor fields.

We were told that people in the Mackenzie Delta have waited more than three decades to see their natural gas resources developed, and we should not stand in their way. They said they now have land use plans and governing authorities in place to ensure responsible development.

People told us that social conditions required improvement in many communities, and some said that the project could make matters worse. People spoke often about problems of drug and alcohol abuse and gambling. They were also worried that the existing systems of health, social and policing services could not cope with the influx of project workers. However, many believed the economic opportunities from the project would help address these social concerns and would not make them worse.

We are persuaded that the project would contribute to improved social conditions. Without new economic activity, social conditions are not likely to improve. Economic benefits would include purchases of services, supplies and materials from local businesses, creation of jobs, and increased flow of royalties, revenues and taxes. Short term impacts from workers would be addressed by closed camps during construction. Closed camps would avoid unplanned contacts with communities.

The project would contribute to strong, self-reliant communities that continue to take care of the land and the people in the North. This would be a benefit for all Canadians.

The land

Aboriginal people and their ancestors have lived in the Mackenzie Valley and the Delta for thousands of years. Their lives and culture centre on a deep attachment to the land and its resources. We heard various concerns about the effects the project could have on the environment. While any economic development in pristine areas has some negative impacts, our goal is to make sure those impacts are kept to a minimum and avoided wherever possible.

Some people were worried about specific impacts such as noise, odours or disturbance of fish and wildlife. Others urged us to look

at the more global impacts of the project and the end use of the natural gas. Some Northerners and environmental groups also urged us to consider the potential impacts of future developments beyond those in the applications before us. In response to these concerns, we have imposed many conditions that will protect wildlife, water, air, and vegetation. We are satisfied that our conditions and the project design would address specific concerns such as the effects of climate change and land settlement due to withdrawal of gas from producing fields.

We consulted with the Joint Review Panel regarding the recommendations they directed to us. They agreed that our conditions fulfilled these recommendations. We also consulted with the parties to our hearing, and they provided comments on our proposed conditions during final argument. Their suggestions resulted in improvements to our conditions.

In addressing the effects of the project we considered the Joint Review Panel Report including the recommendations addressed to us, our own conditions and the fact that the National Energy Board will hold companies accountable for the implementation of these conditions throughout the life of the project. Moreover, many northern institutions and government agencies would also monitor the project so that companies minimize the effects. On this basis, we find the impacts of the project on the land to be acceptable.

The governments of Canada and the Northwest Territories in their response stated the actions and commitments they were prepared to implement should the project proceed. These are aligned with the outcomes we seek to achieve in the conditions to our approval.

If it were the case that the lack of full implementation of the Joint Review Panel Report means that we should accept that some significant adverse environmental effects are likely, we would find these effects to be justified in the circumstances. We reach this conclusion after looking at all the positive and negative effects this project might have and after concluding that the North is considerably better off with than without the project. These potentially significant adverse environmental effects include impacts on Kendall Island Bird Sanctuary and impacts on woodland caribou and other listed species without the early identification of critical habitat as part of species recovery strategies and action plans.

The economy

We observed that sharing is an important value for Northerners. There are several ways that Aboriginal people and other Northerners will be able to share in the economic benefits if the project goes ahead. There would be the direct benefits from employment, contracting, providing supplies and services, and a general increase in economic activity. The Aboriginal Pipeline Group would share in the pipeline's profits. Northerners would gain from other programs such as the Socio-Economic Agreement, the Mackenzie Gas Project Impacts Fund, the benefits plans for the development fields and the gathering system, and the benefits and access agreements. Governments would earn revenues from royalties and taxes.

The economic benefits would be real and large. During the four years of construction, the companies proposing the project estimate they would spend about $16.2 billion on the project. This would increase Canada's gross domestic product by more than $13 billion, and almost

$6 billion in labour income would be generated. Governments would gain about $2.9 billion in tax revenues.

During 20 years of operation, the companies estimate they would spend $5 billion to operate facilities. The increase in Canadian gross domestic product from the project during that period could range from $26 billion to $42 billion. More than $2.3 billion in labour income would be generated, and tax revenues would range from $8.8 billion to $12.5 billion. The federal government would also get between $500 million and $1.8 billion in royalties on production.

In the Northwest Territories, the companies forecast that gross domestic product would increase $500 million annually during construction and by a total of between $1.3 billion and $2.1 billion during 20 years of operations. Annual labour income would increase by $120 million during construction and $48 million during operations. Annual revenues to governments in the Northwest Territories would grow by $12 million during construction and $70 million during operations.

Another benefit to Northerners would be the opportunity to use natural gas in their communities. We are directing the pipeline owners to provide laterals to communities upon request, providing certain economic conditions are met.

In keeping with the principle of sharing, our decision also requires that the gathering and transmission pipelines be "open access." We heard that the North would benefit if the pipelines were open to all shippers, like other pipelines regulated by the National Energy Board. Other companies told us that anything less than open access would discourage them from exploring in the North for additional natural gas resources. We agree with this. We have also provided direction on the tolling and tariff regime that would apply to the mainline and gathering facilities.

With respect to concerns about the design capacity of the Mackenzie Gathering System, we are satisfied that the capacity matches well the capacity of the Mackenzie Valley Pipeline given that other sources of gas could enter the pipeline at various locations, including locations downstream of the Inuvik Area Facility.

As soon as possible—no later than the end of 2011—the companies must file a tariff, reflecting this decision, making it very clear how others may gain access to the system.

We also examined the project based on how well it would serve Canada's economy. We are satisfied that there is sufficient natural gas in and around the Mackenzie Delta to supply the pipeline, and there is a large enough market to use the gas.

Safety

People sought assurances that the project would be designed to address the unique environment in which it will operate. The engineering challenges in the North include cold temperatures, the presence of permafrost, and the potential for ground movement due to frost heave, thaw settlement, earthquakes and slope instability. We heard concerns about whether there was enough detail available about the design and the land along the pipeline route to allow the project to proceed.

We are confident that the companies are fully capable of designing, constructing and operating the proposed facilities. The Mackenzie

Gas Project requires close monitoring throughout the lifespan of the system. We accept the companies' view that part of the design philosophy is to take action when and if issues arise. Our conditions would require that the pipelines be inspected frequently to monitor their performance based on this approach.

The National Energy Board will conduct its own reviews, inspections and audits to make sure everything is done properly from now until the facilities are no longer needed sometime in the distant future. The National Energy Board will work with others throughout. When facilities are no longer needed, the National Energy Board will ensure there is money available and procedures in place so the surface facilities can be removed and the land restored.

Moving forward

Our decision is subject to approval by the federal government. Also, the companies, governments and Northerners have more work to do to prepare for this project. This work includes detailed permitting by land and water boards, completing benefit and compensation arrangements, and deciding on fiscal arrangements for the project. Our decision is a major step towards allowing the project to proceed, but it does not mean the project will be built.

Natural gas markets are still recovering from recession. Other forms of natural gas—including shale gas, tight gas, coalbed methane and liquefied natural gas—are competing in the markets that would be served by the Mackenzie Gas Project. Natural gas price trends remain uncertain. We do not agree with those who say these are reasons to deny the project. Our approval gives Mackenzie Delta gas an opportunity to compete. Denial would block that opportunity.

It is up to the companies to decide whether the project makes economic sense for them based on their view of natural gas prices and project costs. They told us they need until the end of 2013 to conclude fiscal arrangements, put their project teams together, do the detailed route planning and engineering, obtain all the necessary approvals and permits and take a decision to construct. They requested an expiration date of 2016 for our approvals.

Northerners told us that it is important to know how the project is progressing after our decision so that they can prepare and plan for construction. They want to be ready to take advantage of job and business opportunities. We respect these planning needs. By the end of 2013 we require the companies to file an updated cost estimate and report on their decision to build the pipeline. In keeping with these needs, we do not agree with the companies that they should be given until 2016 to begin construction of the project. Actual construction must begin by the end of 2015 for our approvals to remain valid.

Our journey to reach a decision has ended.

K.W. Vollman
Presiding Member
KWVollman

G. Caron
Member
Gaétan Caron

D. Hamilton
Member
D Hamilton

December 2010

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